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MANUFACTURING MARINE STEAM BOILERS

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The boiler shop of the Sun Shipbuilding Co., Chester, Penn., has a normal capacity of six 1000-hp. marine boilers a month, but under especially advantageous conditions as many as nine have been finished in a calendar month. They are of the so-called Scotch type, single ended with three furnaces. The material and workmanship entering into their construction are of the very highest grade of excellence.

THROUGH the courtesy of Robert Haig, formerly Lloyd's representative in Philadelphia but now vice president and general manager of the Sun Shipbuilding Co., and with the assistance of S. Goman, superintendent of the Sun Shipbuilding Co.'s boiler shop, I am enabled to publish the methods they have worked out whereby they turn out just twice as many boilers in a given space of time as other shops of similar size and equipment engaged on similar work. In the headpiece (Fig. 1) is shown a front view of one of the 1000-hp. marine boilers under discussion, and in Fig. 2 the line illustration gives the details of their construction. A careful inspection of Fig. 2 will convey to even the tyro some idea of the large amount of work involved in the building of this type and size of boiler. However, many of these standard boilers have been built in this shop and the men have become very adept at the various operations necessary for their production.

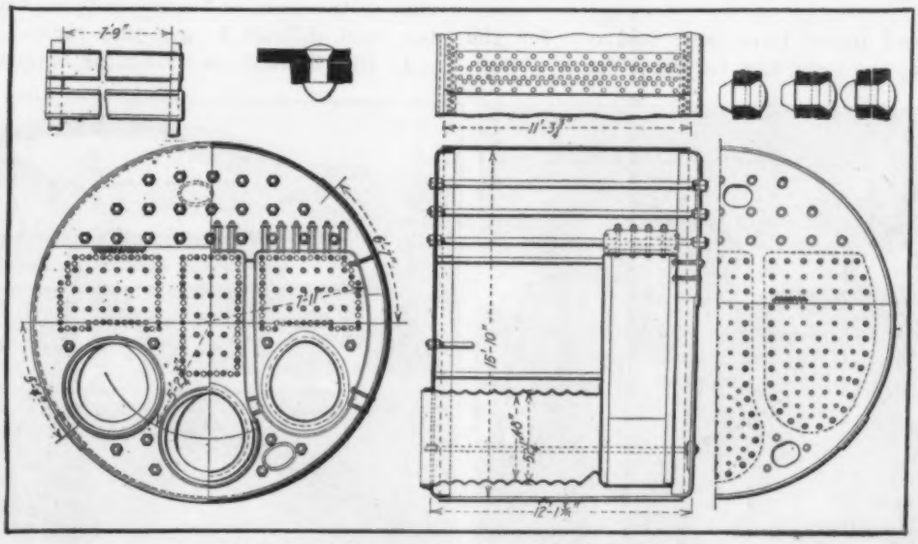


FIG. 2. DETAILS OF 1000-HP. MARINE BOILER

The plates that go into the making of these boilers are received from the plate mills cut to size and shape except for the small amount of trimming that is always necessary on work of this character at various stages of manufacture. For instance, all large openings in the ends are cut with the oxyacetylene torch, as is also the surplus metal on the flanges, etc.; further, all caulking edges of the boiler plate are required to be machine-planed. By "caulking edges" are meant those edges which in the finished boiler must be caulked (that is, peened or upset with a blunt chisel) to prevent leakage. The finished boiler is 15 ft. 10 in. in diameter by 11 ft. 11¼ in. long between heads and weighs approximately 112,500 pounds.

The shell for this boiler is made up from two plates rolled to half cylinders and fastened together by double butt strap riveted joints. The plates as they come from the plate-edge planing machine are each 136½ in. wide, 316⅜ in. long and 1 7/32 in. thick. The plates for the combustion chamber and boiler ends are of various shapes and are shown in Fig. 3.

In all boiler work the first operation is laying out. Where individual boilers are made or where the quantities are small each plate is laid out from the drawings.

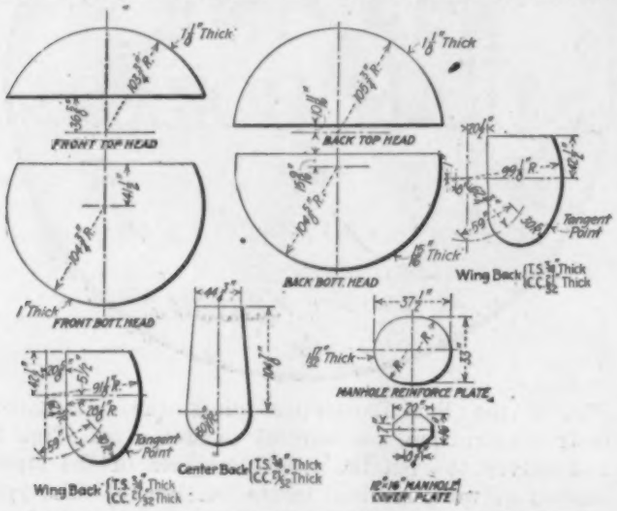


FIG. 3. DETAILS OF PLATES FOR 1000-HP. BOILER

Where the quantities are large, as in this case, practically all the laying out is done from templets.

The templets are for large work made of thin wooden battens about ½ in. thick and of whatever width the nature of the work demands. These are fastened together so that they will not be subject to excessive distortion under working conditions. They provide means for locating on the plates the various parts, such as rivet and stay holes, flanges, manholes, furnace, openings, etc.

After the shell plates have been laid out for the rivet holes along the ends, and for those for the longitudinal seams which will later be between the butt straps, a number of "tack holes" are drilled at specified intervals. These holes are slightly smaller than the rivet holes, but they occupy the same positions. One of the shell plates thus drilled with tack holes can be seen at *A*, Fig. 4. This illustration shows the large vertical rolls *B* in which the shell plates are rolled to the desired curve. These rolls are 13 ft. 6 in. between housings. The rolling motion is operated by a 25-hp. reversible motor. The closing of the rolls to change the radius of the curve is taken care of by a 35-hp. reversible motor connected by suitable gearing to the machine.

When the rolls were set up care was taken to have them as nearly perpendicular to the floor *C* as it was possible to get them. The floor *C* is a level steel plate on which the edge of the plate slides as it enters and leaves the rolls. The setting of the rolls perpendicular to the floor eliminates all the trouble of setting the plate square with the direction of the rolling. This will be understood by those who have done rolling with horizontal rolls.

Preparatory to rolling, a couple of shackles are applied to the edge of the plate as shown at *D*, the hooks from the crane are entered in them and the plate is lifted over and one end entered between the rolls as shown in Fig. 4. The shackles are then removed and the operation of rolling begun.

The speed of rolling is fairly rapid, as one of these large plates (the largest plates of this thickness that have so far been manufactured in this country) can be rolled to a semicircle in about 20 min. The amount of feed per pass depends on the stillness of the material and the thickness of the plate. With these plates a feed of ¼ in. per pass gives satisfactory results.

It will be observed that the roll operator has a templet *E* in his hand, which he uses to gage the curvature of the plate as it nears the desired contour.

The operator exercises particular care to have the ends of the plate to the requisite curvature, these being the most difficult to get just right.

In Fig. 5, at *A*, is shown the templet for one of the

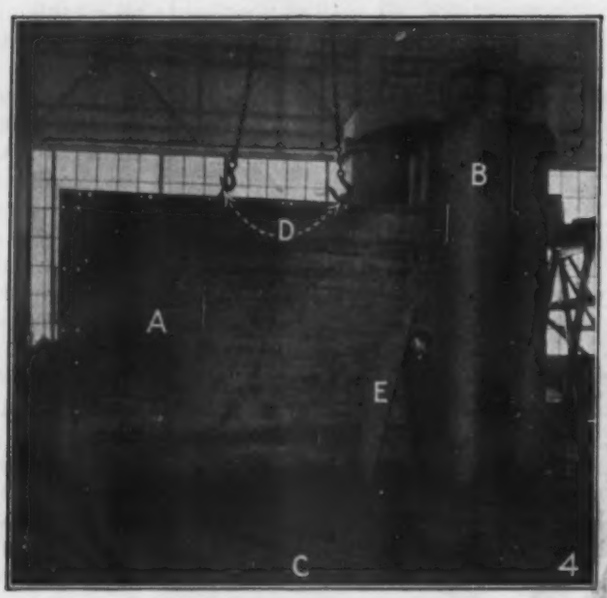


FIG. 4. SHELL PLATE AND VERTICAL ROLLS

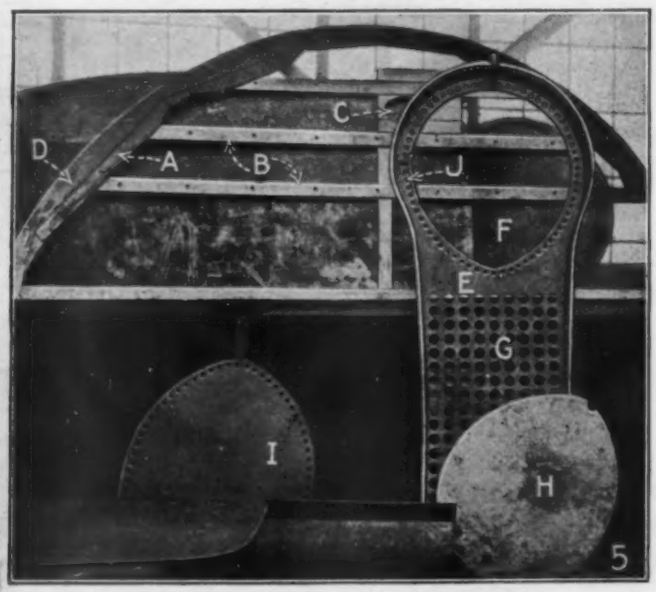


FIG. 5. TEMPLET, JIG AND COMBUSTION-CHAMBER FRONT

FIGS. 6 AND 7. WORK ON THE FLANGING MACHINE

half plates that go to make a boiler end. The principle of construction of all wooden templets is the same. It will be noticed that the battens *B* have a number of holes in them. These are located in the same position as the boiler stays, as can be seen by turning back to Fig. 2. At *C*, in the templet *A*, Fig. 5, is an opening corresponding in size and location to that of a manhole at the top in the rear end of the boiler. The outer edge *D* of the templet locates the position of the flanged edge of the end plate.

The holes in the batten *B* are accurately located and are all bored a certain size so that they will be a fit for the body of the center punch used by the layer-out. The outer edge of the templet is followed around with a soapstone pencil, as are also the openings for manholes and furnaces. After the layout is completed the layer-out unclamps the templet from the plate. The rivet and stay holes have all been located on the plate with the center punch direct, but where the soapstone marks are the layer-out makes a center-punch mark here and there along these marks to verify the accuracy of his layout should any mistakes be made by others during flanging or other subsequent work, for a chalk mark can be very readily erased but a center-punch mark is permanent.

After the top and bottom parts of the boiler ends have been laid out the plates go to the scarfing fire. Here the corners of the half plates are heated one at a time and scarfed. This work is done under a Nazel hammer with the aid of fullers and flatters. It is by no means so easy as it looks and the requirements are very much more exacting than at first glance they would appear, for it must be remembered that these plates must be flanged and fitted together in the shell and that when the boiler is finished it must hold water under 285 lb. pressure per square inch. The next operation on the boiler ends is flanging the edge of the half plates. This is done on the 200-ton flanging press shown in Fig. 6. This machine serves many purposes and is a general-utility tool, as it does all sorts of flanging on boiler ends and combustion chambers and is used for forcing and even for forging work. The flanging press, Figs. 6 and 7, has three cylinders, plate furnace, the bending blocks, and a large and a small small flanging fire. The large flanging fire is arranged in the arc of a circle and is of such dimensions that it will heat one-fourth of the perimeter of the half end plate shown at *A*, Fig. 6. The large flanging fire is visible at *B*, Fig. 7, in which view the flanging press is being used as a forging machine for upsetting the ends of $2\frac{3}{4}$-in. steel bars used for stay-bolts. It will be noted that the flanging machine has an extended base *C*. This serves for holding jigs and fixtures.

A hole is drilled in the exact center of the larger plate of the two that go to make up the end of a boiler. The position of this hole is the same as that of one of the stays and therefore serves a double purpose. During the flanging operation it is used as a pivoting point around which the plate is swung, thus bringing the flanged portions concentric, while later on it is enlarged to accommodate a stay.

Mounted on the extension base *C*, Fig. 6, is a bracket which does not show in the illustration. This bracket carries a vertical pilot pin which enters the central hole in the plate when the larger of the half plates is being flanged. When the smaller half is being flanged it enters a hole in an extension plate which is bolted to the half plate being flanged. This extension plate is so arranged that the hole in it is concentric with the perimeter of the plate.

The flanging press, Figs. 6 and 7, has three cylinders, *E*, *F* and *G*, each of which is of course provided with a ram. During the flanging operation on the edge of the boiler end the ram in the cylinder *E* acts as a hold-down and for that purpose is provided with a flat-faced die block *H*. The edge of the die block nearest the body of the press is curved to the same arc as the boiler shell. Mounted on the bed *C* and immediately

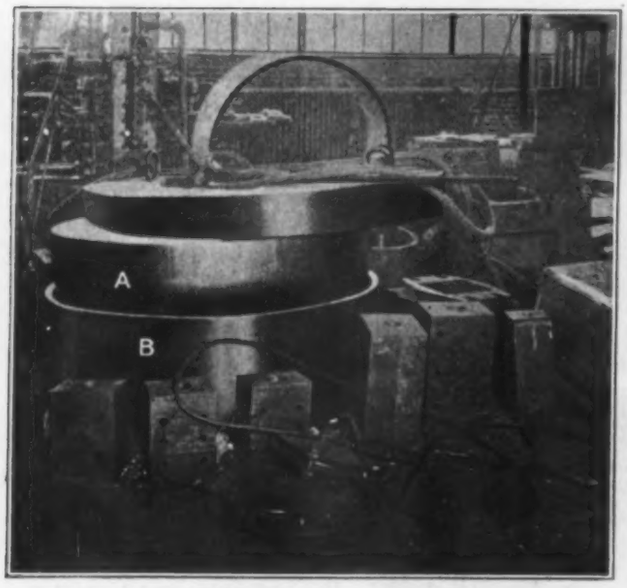


FIG. 8. DIES USED IN FLANGING MACHINE

below *H* is a similar die block. The upper surface of this die block is also flat and the edge conforms to the same circle as that of the upper one, but the edge where it meets the top is rounded to a radius of $3\frac{A}{16}$ in.

Mounted on the end of the ram that works in the cylinder *F* is a wedge-like die head so shaped that the bending of the edge of the plate *A* is gradual; that is to say, the extreme edge of the plate at this point is caused to bend first, the flanging pressure not coming on the fillet till the last of the stroke of the flanging die.

During the flanging operation the ram in the cylinder *G* acts merely as a support to keep the flanging die block up to its work. It carries on its end the slide *J*, which is practically a heavy angle plate with the vertical surface nearest the work planed to act as a guide for a similar planed surface on the rear of the flanging die block.

Four heats are necessary for the completion of the flanging of the edge of either half of a boiler end, the work after each flanging operation being returned to the flanging fire. The fuel used in the flanging fires is coke.

After a sufficient number of half ends have been flanged they are put in the large plate furnace, brought to a good red heat and again taken to the flanging press to be straightened where they require it, after which they are piled away together to cool slowly and anneal.

In the back head of this boiler are three manholes, one at the top in the center line and two at the bottom, disposed on either side of the center line. These manholes are flanged inwardly as shown in Fig. 11, which will be referred to later.

The three openings for the three furnaces are flanged outwardly in the lower half of the front head. The manholes and the furnace openings are flanged with dies, the only difference in the operations of flanging manholes and flanging furnace openings being the difference in the dies used.

After the end half plates are cooled and thoroughly annealed they are ready to be prepared for flanging the openings for the furnaces in the front head and the manholes in the back head.

The flanges for the furnaces are 52½ in. in diameter. Concentric holes 42 in. in diameter are burnt in the plate with the oxyacetylene torch and the plates are now ready for flanging the furnace openings.

In Fig. 8 are shown a number of punches and dies used in the large flanging machine. At *A* and *B* respectively are the die and the punch for flanging the furnace openings as shown at *A* in Fig. 9. The die *A* is made of a heavy piece of boiler plate bent and machined to the required circle. The upper, or entering, end for the punch is rounded on the inside

FIG. 9. FRONT PLATE WITH FLANGED FURNACE OPENINGS

to a 1-in. radius. The die is secured to the base of the flanging machine concentric with the ram *E*, Figs. 6 and 7. The punch *B* is secured to the ram of the cylinder *E* shown in the same illustrations. The pilot pin is used in the same manner as described in connection with flanging the edge, but instead of using the horizontal ram of the cylinder *G* a heavy angle plate is bolted to the base of the press about the position occupied by the slide *J*, Fig. 6. This angle plate is placed so that the vertical flange, which has already been formed on the edge of the plate, abuts against it while the manhole is being flanged, and is by it prevented from spreading out of perpendicular. Before the plate is heated for flanging the furnace openings it is centered on the pilot pin and swung so as to bring each of the openings for the furnaces consecutively under the punch *B*. The ram at each shift is caused to descend and the furnace flanges are each started slightly; that is to say, the flanges after this pressing stand at an angle of about 15 deg. to the plate. This is done to prevent buckling of the plate, which is likely to occur if the plate around the opening is heated and the flanging is finished at one stroke. It also assists the workman to more easily and accurately center the heated plate over the die.

After the furnace flanges have been started as described, the plate is swung so that one of the holes is over the circular fire *K*, Fig. 7, which is so arranged

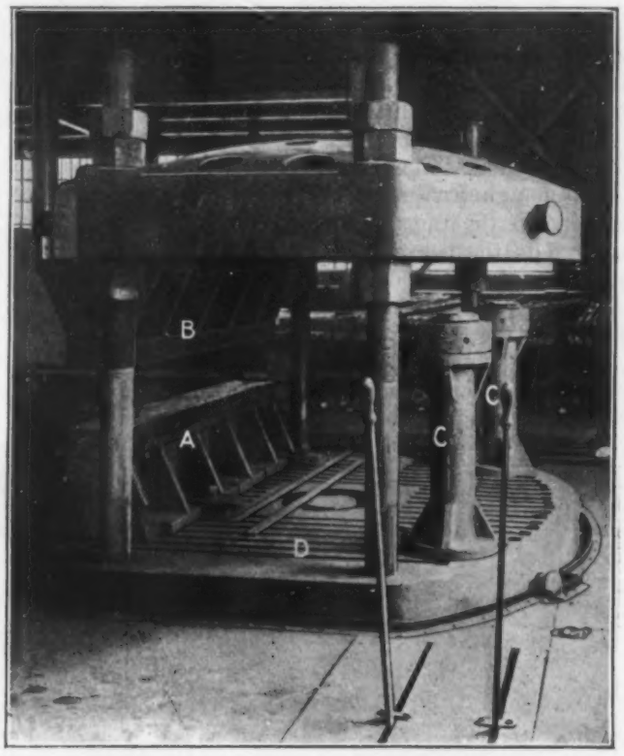
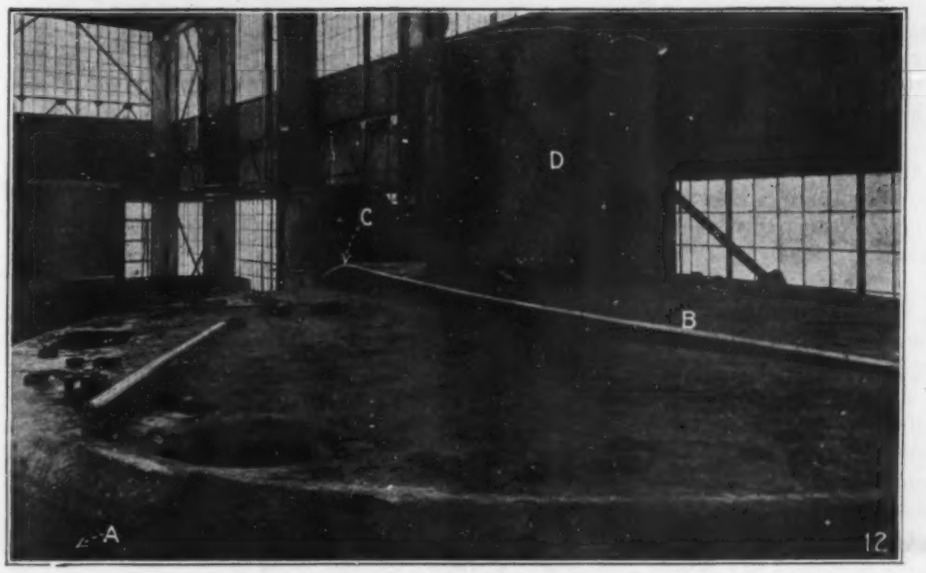


FIG. 10. PRESSING BUTT STRAPS



FIGS. 11 AND 12. WORK ON THE BACK END

that the metal around the opening is brought to the desired temperature. The heating time is about 20 min. for each hole. When heated to a good red the plate is picked up by the crane, swung over and first centered on the pilot pin; when the furnace opening is over the die *A*, Fig. 8, the punch *B* is pushed through the opening. The punch *B* is so secured to the ram that it can be readily released, as obviously it cannot be pulled back through the hole (which has already begun to contract) without distorting the plate. The plate is again swung back to the fire so that the next hole can be heated for flanging, and so on until all three holes are flanged.

The actual time necessary for pushing the punch through the hole is only about a minute, so that the elapsed time from start to finish for flanging the three furnace openings is about an hour. After flanging, the plates are allowed to cool, and when they are quite cold the punch *B* is again pushed through each of the holes to bring them to uniform size.

Before leaving the work of the flanging machine it might be as well to describe one of its other jobs—that of forging or upsetting the ends of the large stay-bolts used in these boilers.

The dies shown in Fig. 7 at *H* are ordinary split upsetting dies. The lower one is secured to the bed of the flanging machine. The upper one is secured to the end of the ram of *E*, as shown. Two rods *I* are secured to the bottom die. At the other end of these rods is a plate *J* held to them by nuts, as shown. The ends of a number of bolt blanks 2¾ in. in diameter are heated in the large flanging fire at a time.

The ram of the cylinder *G* carries a punch *L* the same size as the large end of the upsetting-die opening. When the bars are sufficiently heated the die is opened

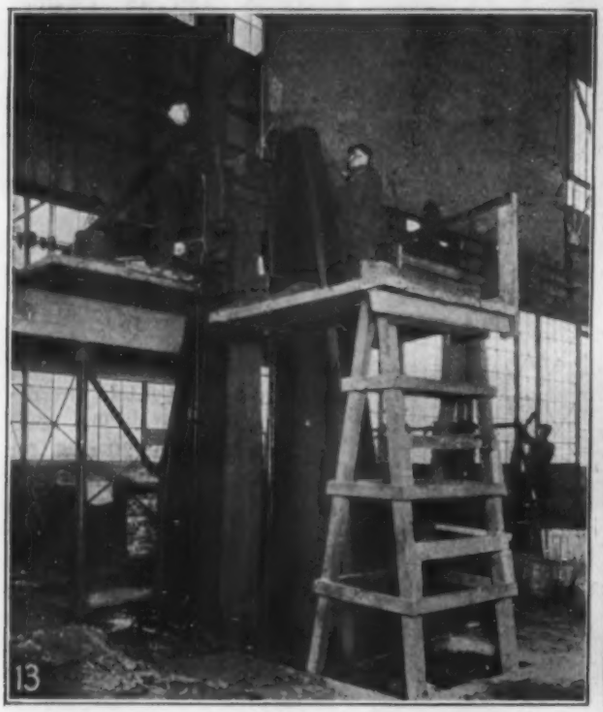


FIG. 13. HYDRAULIC RIVETING MACHINE

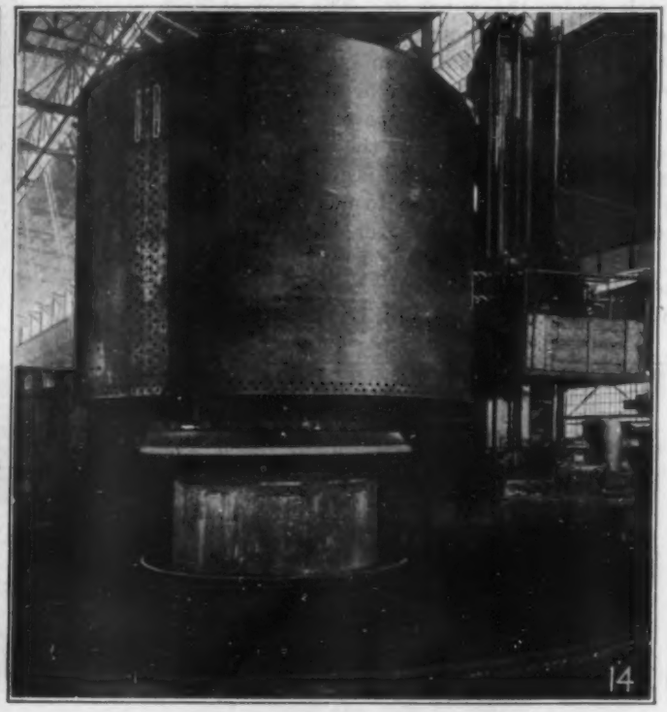


FIG. 14. BOILER-SHELL DRILLING MACHINE

by operating the ram in *E*. The hot end of the bar is placed in the die and the other end of the die abuts against the plate *J*. The die is then closed and the punch *L* advanced, upsetting the hot end of the bolt to 3¼ in. in diameter.

While the work on the boiler ends has been progressing the shell plates have been rolled to half circles and they have been assembled with the butt straps by means of tack bolts through the tack holes previously referred to.

The butt straps are 1⅞ and $1\frac{A}{16}$ in. thick by about 23 in. wide. They are curved to conform to the inside and the outside of the shell with the dies *A* and *B* in the hydraulic press shown in Fig. 10. It will be noticed that the dies are mounted on one side of the press. In order to prevent cramping of the press, owing to their position, two heavy heels *C* are placed as shown to prevent the lower plate *D* cocking when under working conditions.

After the shell is assembled an ordinary tire wheel is run around inside the shell to ascertain its size accurately. One of the heads is then put together as shown in Fig. 11. This illustration shows the head after the two scarfs *A* have been fitted. This job is done by fitting together two of the rough-flanged half ends, building a rough furnace of fire brick around the scarfs and heating the job at this point with a large oil burner. The firebricks are removed as soon as the desired heat is reached and the scarfed ends are hammered with sledges and later fullered to bring them to close contact. When fitted as shown in Fig. 11 the curve of the flange at the joint is tried with a templet and the size of the flange is measured with the tire wheel to see that it will enter the shell and be a snug fit. When the head measures correctly tack holes are put in the cross-seam of the head and the two parts are bolted together and the laps are laid off to a templet of the shell. The tack holes in the shell of the boiler are transferred to the flange of the boiler end. This is easily done with the aid of a ribbon of paper which is used as a templet. Tack holes in groups of two are then drilled in the flange, after which the head is ready to assemble in the shell.

The operation of assembling is shown in Fig. 12. The shell is laid on its open end and one-half of the back end is lowered by the crane until drift pins can be entered through the tack holes in the shell and end as shown at *A*. These hold the half end until the other half is placed. In some shops the entering of the second half is a tedious and hard job with a great deal of heavy sledge work. Here it is a simple job. Wedges are driven between the shell and the half end, already placed, close to where the two half ends will be joined. The second half, shown at *B*, is then lowered by the crane till the scarfed ends enter the opening made by the wedges. Usually one side drops to position as soon as the crane is released; the

other end generally remains cocked up at an angle as shown at *C*. The crane then picks up the heavy weight *D*, which is a steel box filled with punchings, and lowers it on the high side as shown. This forces the plate *B* to its place. The photograph for Fig. 12 was taken before the crane released the weight.

Drift pins are now entered in the tack holes and driven home. These are followed by bolts inserted from the inside after the individual drift pins are driven out. The nuts are set up on the outside as tightly as it is possible to set them with a long wrench. The shell with the one end in is then taken to the big hydraulic riveter, or "bull," as shown in Fig. 13. Male and female dies are put in the machine. These dies conform to the curve of the outside of the shell and

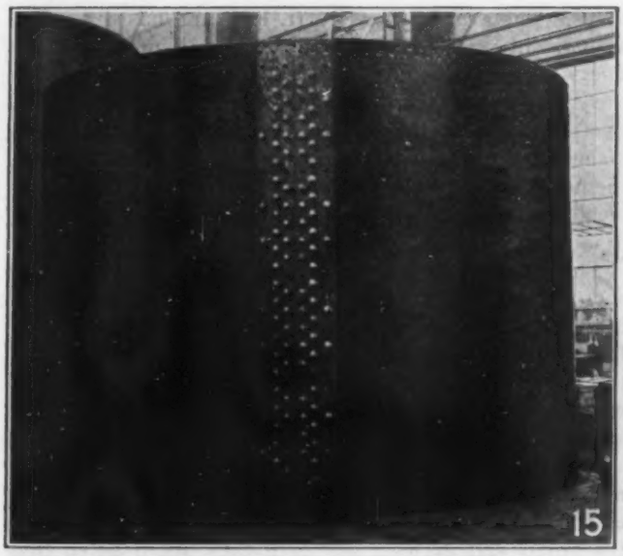


FIG. 15. SHELL WITH BUTT SEAMS RIVETED

the inside of the flange. The gang then turns the shell slowly, as it is supported from the swivel hook on the crane, 3 or 4 in. at a time, and at each shift the hydraulic ram squeezes the shell and flange together. While the squeezing takes place the nuts on the tack bolts are set up tight. When the entire circumference of the boiler has been thus treated the shell and head are a fairly close fit for each other. The shell and head then go to the shell drill shown in Fig. 14 to have the rivet holes drilled through the butt straps and shell and through the shell and head flange. The back head is then removed and the same operation is gone through with the front head. The fitting of the front head is not done, however, until the shell of the boiler has been riveted as shown in Fig. 15. Before the shell is riveted it is taken apart and thoroughly cleaned and all the burs are removed from the drilled holes.

The flanges of the heads as they come from the flanging machine are deeper than required by the drawings. This excess metal is burnt off with the oxyacetylene torch and the burnt edge dressed off smooth with the pneumatic chisel so that it can be properly caulked.

After the front head has been fitted and drilled it is removed, cleaned and burred. The back head is again reassembled in the shell and these are taken to the bull, where all the rivets in the back head and shell are driven before the work is sent down the shop where the combustion chambers and other internal work are fitted.

It may as well be mentioned here that there is practically no back-tracking of the work in the boiler department. The raw material enters at the door next the material yard and the finished boilers are loaded on flat cars at the door nearest the ship ways.

For assembling the front head and the combustion chambers the boiler is stood upright on the back head near the shipping end of the shop.

While the work described has been going on, the combustion chambers have been under construction. Their shapes will be seen in the detail, Fig. 2. There are three of them—a right-hand, a left-hand, and a center one—each of which is different from the others.

FIG. 16. PARTLY FINISHED COMBUSTION CHAMBERS

Two partially completed combustion chambers are shown in Fig. 16 lying with their fronts down. Much of the work in the boiler shop, such as drilling and chipping, is done with air-operated tools. It will be noticed that two "old men" are bolted to the top of one of the combustion chambers in the foreground, where they were left after the sides had been drilled. It will also be noticed that these combustion chambers are assembled with tack bolts as were the boiler shells.

The holes noticeable at the end marked *A* will later be threaded for stay bolts which pass through the combustion-chamber back and the back end of the boiler. The fronts of these combustion chambers have not yet been put in. They have a large opening, quasi-oval in shape, located near the bottom for the reception of the flange at the rear end of the furnace. Above the opening for the furnace the front of the combustion chamber is drilled for the regular and stay tubes. Fig. 2 makes the construction readily understandable. In Fig. 5 a front plate of a center combustion chamber is shown at *E*. The flange *A* of the furnace shown in Fig. 17 is riveted around the quasi-oval opening *F*, Fig. 5. The holes in the part *G*, Fig. 5, are for the reception of tubes. When looking at Fig. 5 one must remember that the combustion-chamber end is upside down to the position it will occupy on the boiler. At *H* in Fig. 5 is shown the piece that was burnt out before the furnace

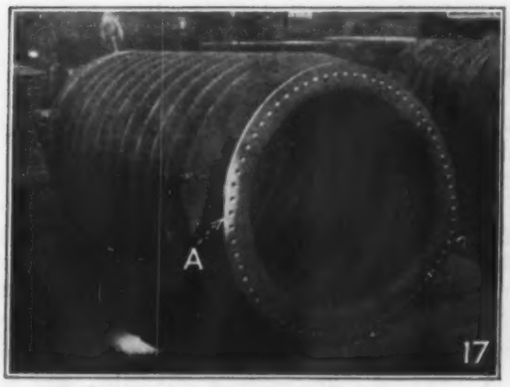


FIG. 17. CORRUGATED FURNACE

FIG. 18. DRILLING RIVET HOLES WITH WALL RADIAL

opening was flanged, and at *I* the plate-steel jig used for drilling the holes *J* for the rivets that attach the furnace to the front of the combustion chamber.

While the boiler rests on the back head, as previously stated, all the caulking is done on the butt straps and the flange of the back head. When this is completed, distance pieces are placed on the back head inside the shell and the combustion chambers are lowered into place. The front head is then put in and drift pins put in to locate and hold it in place. The distance from the fronts of the combustion chambers to the boiler front is then measured to see if the distance is correct. If it is not then other distance pieces are used to bring the combustion chambers to the correct height. With the distance correct the front head is riveted in place and at the same time the shell stays are put in.

The furnaces are next put in and riveted to the front end and combustion chamber. The boiler is then turned up so that it rests on the testing blocks and the stay-bolts and tubes are put in, which completes the work.

In the boiler shop there are a number of interesting tools that could in many cases be adapted for other lines of work. In Fig. 18 is shown a radial drilling machine that is in common use in many shipyards and boiler shops. The arm is about 18 ft. long and has a vertical adjustment, on the slide bolted to the wall, of about 8 ft. The work shown is on trestles about 5 ft. high, so that work 13 ft. high can be handled by this machine. An electric motor at the back of the vertical column furnishes power which is transmitted to the drill through the horizontal shaft above the I-beams of the horizontal member. In spite of the spindly look of this machine it is fairly rigid.

The oxyacetylene torch is much used in the boiler shop for cutting, and in locomotive shops it is also much used for welding tubes and other parts into their places. It does not seem to have found much favor for this latter work in marine shops, however, and marine-boiler makers prefer to expand their tubes and caulk their seams in the old way.

Portable air-operated drilling, reaming and tapping machines are used to a great extent in this shop. Many of the stays for the combustion chambers pass through the boiler end as well, and long taps are used so that the threads in the holes in the two members will match the threads on the long stay bolts. These taps are driven with air drills and seem to handle the work all right. Much of the drilling on the boilers is also done

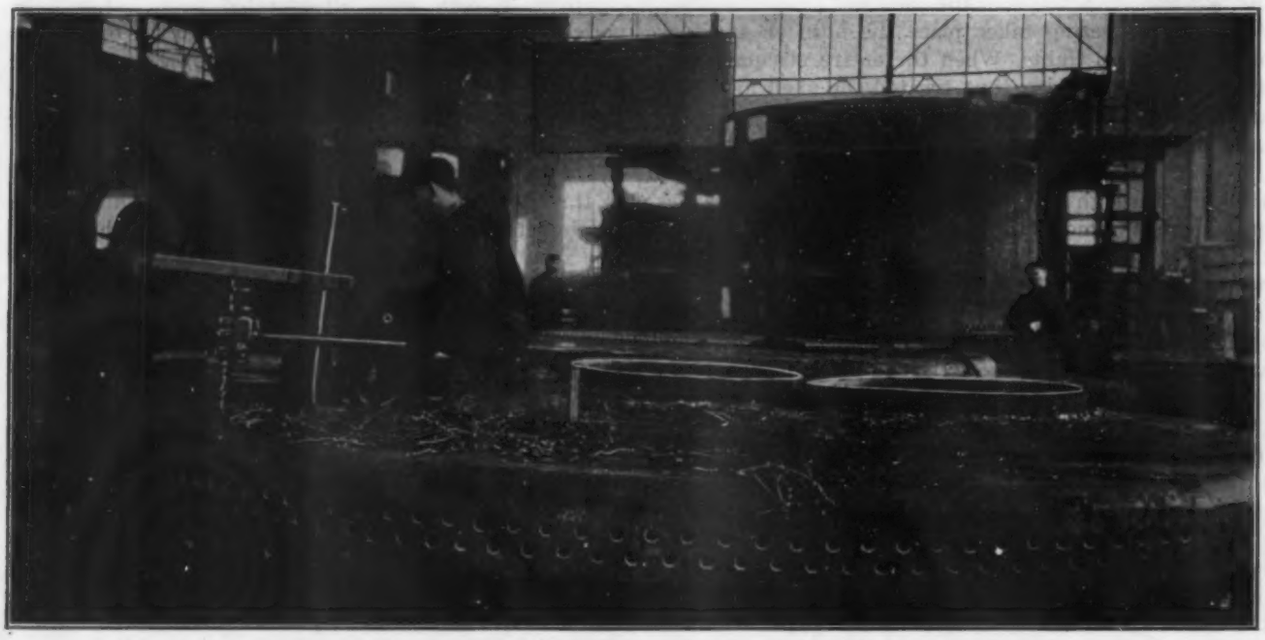


FIG. 19. DRILLING SEAM IN HEAD WITH AIR DRILL

with air-operated drills as in Fig. 19. Two men with an "old man" and an air drill are drilling the holes in the seam in a front head of a boiler.

The plate-edge planing machine is much used in the boiler shop for planing plates the edges of which have to be caulked later. In Fig. 20 is shown a modern plate-edge planing machine. The wires at *A* are similar to ordinary trolley wires except that they merely convey the desires of the operator to the motor, which drives the operating screw *B*. The controller is located on the carriage at *C*. The operator rides along with the tool, standing on the platform *D* dependent from the carriage. The plate *G* is held by the air-operated clamps *E* and if need be by the screw jacks *F* as well. This method of holding by air clamps is very good, as the pressure is constant; if the beam *H* gives when the air is turned into the clamps *E* they all automatically take up, while with screw, wedge or lever clamps each one would have to be followed up to obtain even approximately equal clamping pressure.

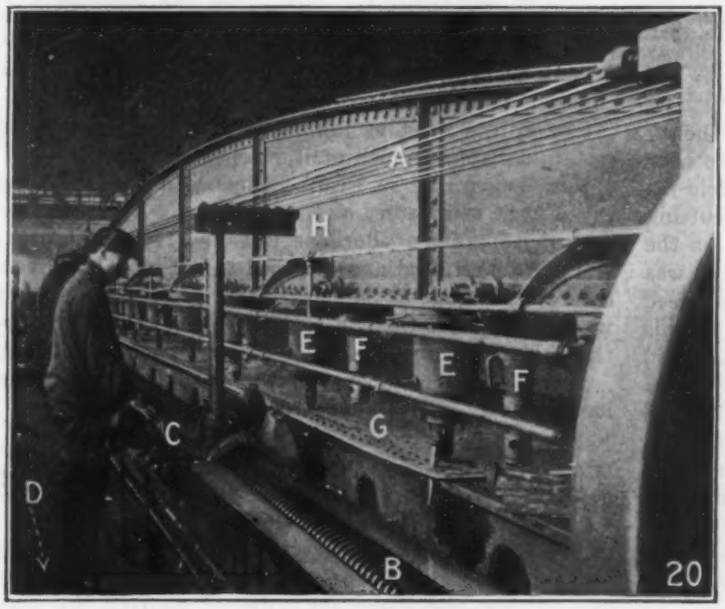


FIG. 20. PLATE-EDGE PLANING MACHINE

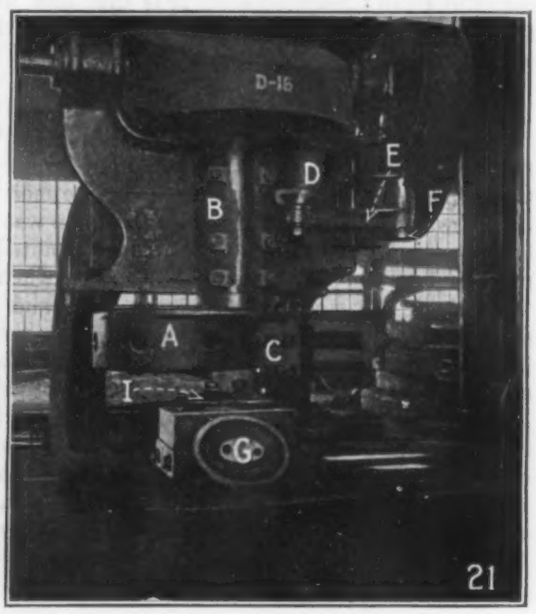


FIG. 21. MANHOLE-DOOR FACING MACHINE

In Fig. 21 is shown a manhole-door turning machine. At the top is a large wormwheel which drives the head *A* through a shaft in the bearing *B*. The head *A* carries a toolpost *C* that is adjustable to and from the center of the head *A*. The distance of the tool from the center determines the minor axis of the ellipse.

A slide at *D* has an adjustable block that carries a pin on which one end of the connecting-rod *E* fulcrums. The other end of the connecting-rod fulcrums on the fixed pivot *F*. By altering the position of the slide *D* and the tool slide *C* various ellipses may be faced. The manhole doors, which are pressed hot from boiler plate in the general-utility press referred to earlier in this article, are drilled for the dog studs as shown in the sample *G*. They are bolted to the holding fixture as shown at *I*. The screw for the tool slide is provided with a star feed for automatically traversing the tool across the face of the work, or it can be fed by hand. The resultant work is not only better than that done with the pneumatic chisel but is done faster.

Sammy's Shop—Another Boy

BY W. OSBORNE

Perhaps Sammy should have made more allowance for the mistakes of the new boy, but when one gets a boy who has a general look of intelligence and who has been through the common-school branch it is apt to be taken for granted that he naturally knows a few things even if he never did work in a machine shop before.

Frank could not deny his ignorance of the machines in the shop, but then, as he said, "How am I to know? I never even seen a book that will tell me."

Sammy had tried to take away this excuse by giving him a number of circulars. Among them was one describing a lathe which the maker was trying to interest folks in.

Frank had studied this lathe circular for several days in his spare time and had evidently been comparing the statements with the lathe which he was running, and which was older than he was. His study had not made him feel that the charge of ignorance could not still be made.

Taking advantage in a lull in Sammy's activities he came with the circular and asked for enlightenment.

"This says a lot of things that I don't understand," said he.

"What are they?" asked Sammy. "Perhaps I can explain them."

"Well, right up here on the top it says, 'Ample oiling devices on all bearings.' What is an 'ample' oiling device and how can I tell one when I see it?"

Sammy thought that it might save time if he got all of the inquiries before he began to answer and so he said: "Is there anything else that you don't understand? If there is, let me hear it."

"Yes, there is lots more. What is semisteel, and how does it insure permanent alignment of the bed? How big does a piece have to be to be 'massive,' like this says that the headstock is? What is the 'best' phosphor bronze made out of, and how do you know it from the

other kinds when you see it? If the carriage of the lathe that I am running is not 'heavy' with 'long' bearings on the ways and a 'wide' bridge, how am I to know a carriage that has all of these advantages?

"One of the things that you were going after me about the other day was that I was not keeping the ways on the bed oiled well enough. This lathe is 'provided with ample oilers and with oil grooves in Vs, keeping a constant flow of oil along the shears.' Couldn't you put ample oilers on my lathe and cut oil grooves in the Vs so as to keep a constant flow of oil along the shears on it? This lathe that the paper tells about has something in its 'construction' that makes it last longer without repairs than almost any other lathe now being built, and of course that would mean a whole lot longer that it would last than the old ones like yours that I am running. I have looked all over the pictures and the reading, and I can't imagine what it is that they have like that on it anywhere. What do you suppose they are telling about?

The Question of Feed

"There is another thing that puzzles me. When I first came into the shop it seemed funny to me to hear talk of the feed on a lathe until one of the men told me that it was all right because when the lathe was cutting it was eating off the stock that was not wanted on the piece and so you were 'feeding' the lathe when it was 'eating' off the stock. I could see that, and so feed seemed to be natural enough after a while; but in this lathe they say, 'In the apron a bronze worm feeds upon a steel worm sleeve, which in turn is keyed to a splined lead screw, removing all wear and tear from the lead screw.' This must be a good arrangement some way or other or they would not call attention to it, and then if it wasn't it could not remove all wear and tear from the lead screw, and it does that for they say so. But how does a bronze worm *feed* on a steel worm and not hurt it?

Safety Devices

"There is another thing that has bothered me. It says, 'Safety device provided between the feeds and lead screw, making it impossible to engage but one at a time.' That seemed as though more than one feed must be used all the time; but I thought that because I did not understand the shop talk, just like a lot of other things, but Bill says that they mean just what they say. He says that this is such a big and strong lathe that they have to have two feeds because the way they hank the stock off so, springs everything so much that if the feed should stop the tool would dig holes in the work and spoil it. Having two feeds divides up the work between them and makes it safe. And Bill told me another thing. He showed me where it said this lathe had 'simplified accuracy' on it, and he said that one of the reasons that my work was not any better was that my lathe did not have it on. I asked him to tell me what it was and where to look for it, but he said that he was too busy, and anyhow that was part of the boss's job to show me those kinds of things because there might be a patent on it and he might get into trouble."

Frank stopped and looked at Sammy. It was plainly to be seen that he felt that Sammy had not used him altogether right in giving him a lathe to run that was so far behind the times while there was such good ones that the makers were willing to supply.

Sammy looked at Frank and wondered how far back it would be necessary to go into machine-shop lore to be able to get Frank on a solid foundation.

He had looked over the circular from the lathe people and had not seen anything so much different from what he had found in others to give it any particular thought, but here was a boy at least as bright as the average boy, but who came from a family that did not have any mechanical traditions in it. Inquiry showed that the boy did not even carry a knife around with him.

Effect of Ancestors

His ancestors had been clerks, schoolteachers and merchants and had not been interested in machinery or its processes. He might in time make a good workman, or even a good mechanic, but it is likely that he would always view his work from a different standpoint than that of the boy whose father and uncles and grandfathers had worked in shops or with or among machinery.

Sammy did a lot of talking with Frank, but is not certain as to how much of it reached the mark.

To a boy raised as Frank had been a machine shop was a place of mystery and a place where he would feel at a disadvantage. Perhaps it would make him restless and dissatisfied and disposed to not stay even with careful handling on Sammy's part, but in any case it was not safe for Sammy to assume that he knew anything when a new job or change of work was concerned.

Perhaps, with the present dilution of labor, others have been up against the same problem.

The Need of an Employment Manager

By B. A. Holdener

The various articles in your pages concerning the personnel department seem to agree well, but they have not touched the important point of proving the need for such department to the plant manager. This individual must be thoroughly convinced of the need for the employment manager before he will provide proper equipment and allow sufficient freedom of action.

Several months back one of your contributors mentioned that the usual plant manager, in general a product of the older industrial organization, thought in dollars and cents, and the personnel department must be reduced to figures to show cause for existence. A step in this direction may be made by showing the purchasing agent that he is safeguarding his company by getting material from the concern with the lowest turnover. The deliveries will be as promised and the quality of the output better maintained.

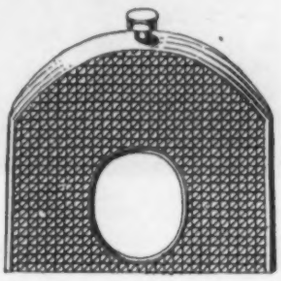
To fully convince the purchasing agent it may be necessary to select some special cases of poor shipment or rejection, but the real employment manager will be able to "sell" his idea. Once the plant head finds high turnover means loss of orders the dollars and cents value of the personnel department becomes evident.

The only difficulty, and it will soon disappear, will be in getting turnover figures, as many manufacturers lack the necessary records from which to compute. The right to ask for turnover figures is just as valid as asking for a bond.

BUILDING RADIATORS FOR AUTOMOBILES *and Other Purposes*

By Ellsworth Sheldon
ASSOCIATE EDITOR, AMERICAN MACHINIST

A very essential part of the power unit in automobile motors or wherever internal-combustion engines are used is the radiator, or means for the dissipation of the surplus heat generated, which would very quickly put the machinery out of commission if it were not taken care of. A description of some of the processes involved in the manufacture of the cellular, or honey-comb, type of radiator is here appended.



WHILE it is the duty of every internal-combustion motor to transmute the energy liberated by the burning fuel directly into power, and the efficiency of every such motor is the direct measure of its ability to do so, the fact is that only about 30 per cent. of the total energy is so utilized; the remaining 70 per cent. must be thrown away, and that as quickly as possible if the engine is to be kept moving. Approximately one-half of this waste is carried off by the exhaust gases, leaving from 30 to 40 per cent. to be dissipated through radiation, all of which in the case of the air-cooled motor takes place through the heated metal in direct contact with the air. By reason of the enormous amount of heat generated and the difficulty in getting rid of it in this manner the air-cooled motor has made little headway, having been supplanted in practically every field by the water-cooled type, even to that of air-craft work where the weight of the cooling plant with its extra 100 lb. or so of water is an appreciable disadvantage.

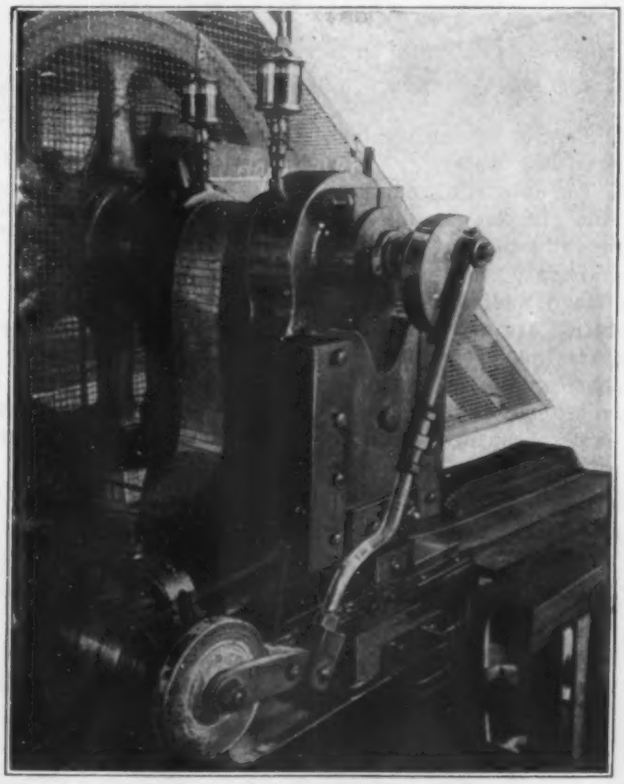


FIG. 1. FORMING THE METAL TO MAKE THE UNITS

The marine motor is of course not subject to this disadvantage, as it may take water for cooling the engine from the outside. Nor does the stationary motor suffer seriously, as the radiating parts may be located wherever desired; weight does not matter and the radiator itself may be a barrel or a brook, as most convenient.

It is in the case of the automobile engine that the consideration of thermal units in relation to units of weight assumes vital importance and the efficiency of the radiator as a cooling medium is brought to its highest degree. Radiators for dissipating heat generated by internal-combustion motors may be divided into two general types—the tubular and the cellular, or honeycomb. In the tubular type two chambers, or water containers, are joined by a large number of small tubes, usually round or hexagonal in section, through which the heated water flows, transmitting its heat through the metal walls of the tubes to the surrounding air. The radiation is accelerated by thin fins of metal disposed about the outer surface of the tubes as annular rings, longitudinal vanes or, in some cases, in the form of a helix, the fin usually being soldered to the tube to reduce the heat resistance of the joint to its practical minimum.

In some tubular radiators this disposition of cooling surface is reversed, the tubes being set in a header at each end, the water introduced into the space between the headers and surrounding the tubes, while a current of air is blown through the latter. In the cellular type of radiator there are strictly speaking no tubes, though in the shops of their builders the word tube is used to refer to any air passage between the cooling surfaces. This type of radiator is usually built up of sections of thin sheet metal folded upon itself in various ways to

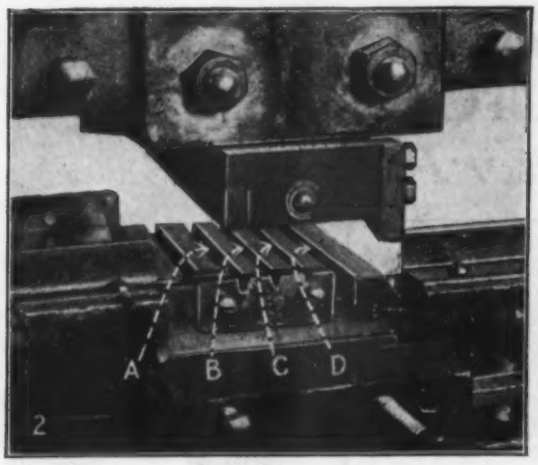


FIG. 2. TOOLS IN THE PRESS

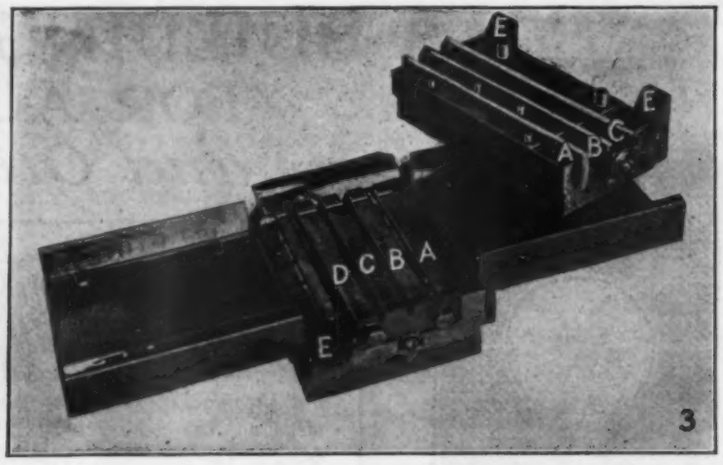


FIG. 3. CLOSER VIEW OF TOOLS

form air passages, the shape and size of which vary with different makers, but the object in all cases being to bring the greatest possible area of surface in contact with the air and to reduce the water passages to the thinnest possible section that will allow the normal flow of water through them without serious danger

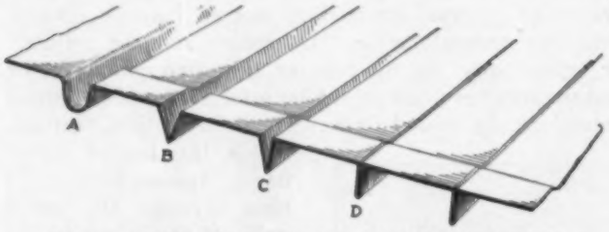


FIG. 4. SECTION SHOWING SUCCESSIVE STEPS

from clogging by reason of sediment or of nonfreezing compounds introduced into the cooling water.

While either type is available for automobile engines the necessity for establishing the greatest possible radiating surface per unit of weight renders the latter type most advantageous in the aircraft field.

The radiators built by the Mayo Radiator Division of the Marlin Rockwell Corporation are of the cellular type. This company manufactures many styles of radiators to meet the varied requirements of automobiles, trucks, or other service, and while some of these radiators differ considerably in general appearance the principle involved in their construction is identical, all radiators being built up from "units" which differ from each other only in their length and the combinations in which they are arranged.

The material of which the units are made is soft-drawing brass of 0.005 in. gage and from 2⅜ to 4¾ in.

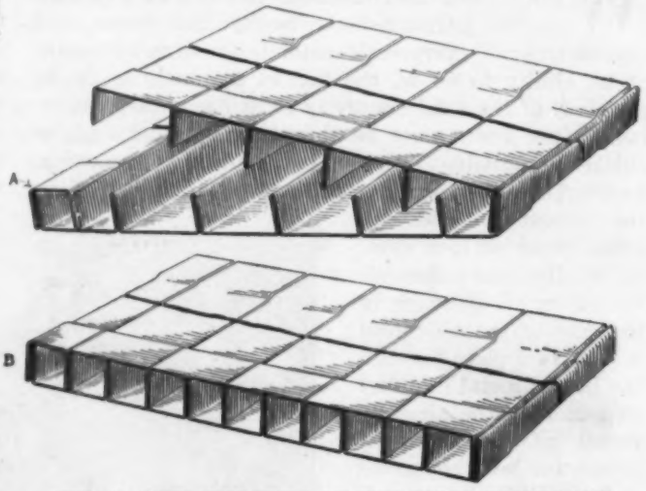
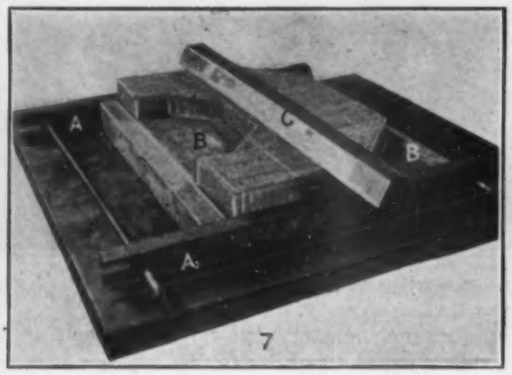
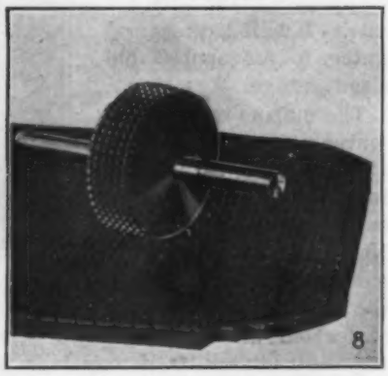


FIG. 6. HOW THE ENDS OF THE UNITS INTERLOCK

in width. It comes to the factory in coils containing 60 to 100 lb. each, and the first operation is to convert it into the cooling units. For this purpose the coil is mounted upon a reel to the left of the press shown in Fig. 1 and is fed through the tools by the roll-feed movement.

The tools used for this operation, shown in Figs. 2





FIGS. 5 TO 8. BUILDING UP THE CORES
Fig. 5—Bending the units. Fig. 7—Setting up a core. Fig. 8—Ironing out a core

FIG. 9. A SOLDERING OUTFIT

FIG. 11. A SOLDERED CORE

and 3, perform four operations, the material being moved forward one step at each stroke of the press, so that after the fourth movement a completed bend is produced at each stroke. The first step of the tool at

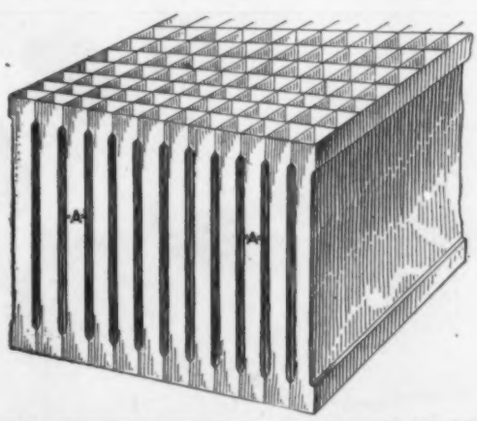
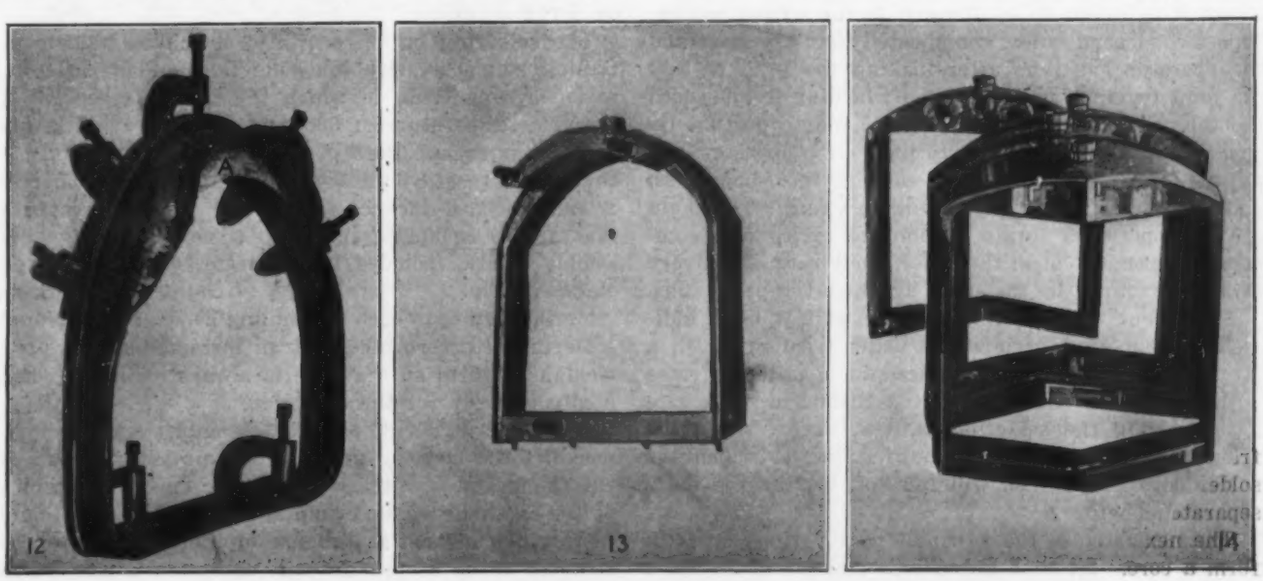


FIG. 10. SHOWING HOW THE UNITS ARE BUILT UP

A makes a rounded groove across the width of the metal, this tool being so designed as to take all the material that will be required for the completed bend and thus avoid drawing subsequent forms out of shape.

Fig. 2 shows the tools in the press, and Fig. 3 shows the same tools on the bench, their positions being reversed in this latter view. Fig. 4 is a section of the unit as it would appear if the press were stopped and that portion lying in the press tools were cut out. Like letters refer to like or corresponding parts in Figs. 2, 3, and 4. It will be observed from Fig. 4 that the edges of the metal are swaged or drawn above the general surface of the strip in such a manner that each groove is enlarged a trifle for a distance of about ⅛ in. at each end. The tools are shaped so that this enlargement is formed at the first step and maintained throughout the succeeding operations *B* and *C* where the half-round groove *A* is drawn into a sharp V until at the fourth step *D* the walls of the groove are closed upon each other and the erstwhile groove has become a flat projection extending at right angles to the strip from which it was formed. This projection, when the strip is folded into a unit, will be one of the partition walls dividing the air passages into square tubes or "cells." The press runs continuously and the formed strip flows out on a long bench where a boy with a pair of tinner's shears cuts it off into lengths to form the units designated upon his shop order.

The cut strips then go to the hand-bending operations,



FIGS. 12 TO 14. RADIATOR CASES

Fig. 12—Drawing a core to shape. Figs. 13 and 14—Other forms of cases

the first of which, Fig. 5, is done by a compound lever device which folds the end of a strip completely over as at *A*, Fig. 6, while the second, which is done in a similar tool, doubles the strip upon itself in such a manner that the end can be interlocked with the end previously folded as shown at *B*. This folded strip is now placed in a clamp and dipped first one side and then the other in a solder bath, which joins all the surfaces in contact and makes a semi-rigid unit of the hitherto loose and pliable strip of folded metal.

These operations follow successively, the bending tools and the soldering bath being distributed along the bench at the delivery side of the press, each operation being so calculated that the work is in practically continuous movement from the time it leaves the forming tools until the finished unit is stacked in a rack ready for the assemblers.

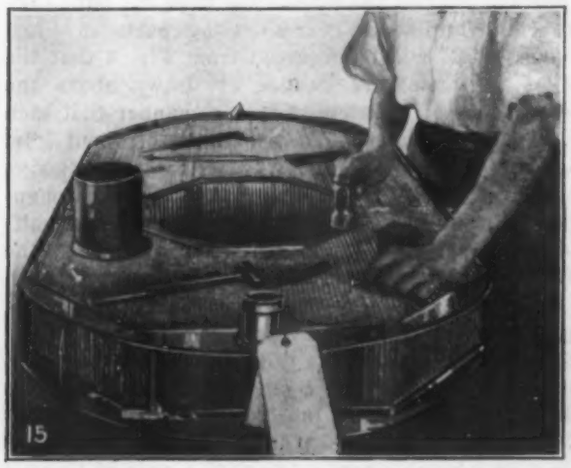
Thus there are four operators to each press. A boy cuts the strips to lengths, gaging them by means of marks upon the bench, and each strip as he snips it off is within easy reach of the left hand of the girl who makes the first bend. This operator after completing her operation lays the strip down to her right where it is picked up by the girl at the second bender. This second bend is less complicated than the first, and the operator has time after making the bend to lock the joint together as at *B*, Fig. 6; holding it thus with the thumb and finger of the right hand to prevent its opening she passes it direct to the fourth operator who puts it in a clamp, dips each edge in the solder bath and then stacks the completed unit in a rack. The chain of four operators forms a complete cycle, each component dependent upon the other, their rate of delivery being determined by the speed at which the press runs.

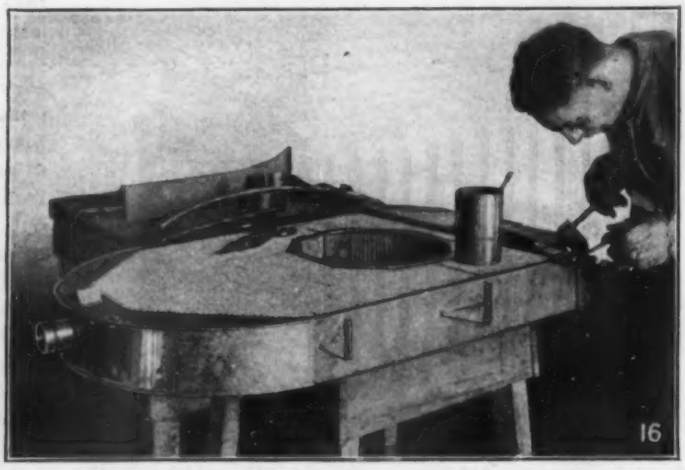
At present the soldering of each unit is done individually, but an experiment is being tried in which a large number of units are placed in a suitable frame with strips of aluminum between them and the entire lot dipped in the soldering bath at once. When the frame is removed the aluminum strips, to which the solder does not adhere, will fall out, leaving the units separate as before.

The next step is the assembling of various units to form a core. As each automobile manufacturer has a design which is peculiar to his car or truck, these cores assume many shapes and sizes.

The assembler's bench is a large cast-iron plate supported at a convenient height upon a wooden frame and each is adjacent to a soldering bath. Fig. 7 shows such a bench with an assembled core upon it ready for soldering. The assembler has ready to his hand racks of units of various lengths, and, given a shop order for a certain radiator, he selects the required units, building them up inside the iron clamp *A*, spacing the corners and necessary openings with the wooden blocks *B*, very much as a printer would set a display advertisement in a chase. The frame is then tightened and the assembled core flattened and straightened by rolling with the wheel shown in Fig. 8. This is applied with considerable pressure and the core is rolled or "ironed" out in both directions (the roller is never used cornerwise as shown in the cut) until it is flat and the cells present a smooth and regular appearance.

The temporary supporting brace *C*, Fig. 7, is then "tacked" on with a hand soldering copper, being fastened at each edge of the core and in the center. This is for the purpose of holding the core flat when it is lifted by the clamp, otherwise it would sag in the middle. Several supporting braces may be required on large cores.





FIGS. 15 AND 16. FINISHING OPERATIONS ON THE CASES

The soldering outfit consits of a shallow tank containing a noncorrosive soldering flux, and a cast-iron solder-melting tank, in which the solder is kept at a uniform temperature of 680 deg. F. by means of suitable gas burners. Both of these tanks must be larger than the largest single core to be dipped or soldered. A small hooded furnace for heating the small coppers that are in constant service on some part of the assembly is also included in the outfit, one of which is shown in Fig. 9. There is not, of course, one of these soldering outfits to each assembling bench, as the actual soldering of a core takes but an instant, but there are enough of them so that one is always available when a core is ready for the operation.

The soldering is done by the assembler and a helper, who lift the core by grasping the projecting ends of the clamp and lay it across the flux tank. The width of the side bars of the clamp and the level of the liquid in the tank as well as the size of the tank and of the radiator to be dipped are all factors in a calculation which determines the depth to which the core is immersed, and the same calculation applies to the solder-

ing bath, to which the core is immediately transferred, the object being to flow the solder over only the enlarged portion of the cells mentioned in connection with the forming operation.

This enlarged portion is the distinctive feature of the Mayo radiator, and it will be observed from Fig. 10 that when the units are placed in contact in whatever combination there is always the water passage *A* between them. A two-section core for a well-known automobile is shown in Fig. 11.

After soldering one side of the core the temporary brace *C*, Fig. 7, is removed by passing the flame of a gas torch over it, and the core is then turned over and the soldering process repeated on the other side.

The case of the radiator is built up largely by hand operations from sheet brass of 0.020 gage. Where the number of radiators of any one kind is sufficient to warrant the expense press tools are provided for drawing and forming some of the sections, but the size and unwieldiness of many of the cases, together with the comparatively small number of any one style required upon any individual order, ordinarily renders this impractical, and the parts are therefore got out on hand bending and forming machines and foot and power shears.

One of the hand-forming operations is shown partially completed in Fig. 12. The irregular-shaped strip of brass which forms the top of the case has been bent around the iron form *A*, being fastened thereto by iron clamps and drawn down over the curved portion of the form by hammering with wooden mallets. During this drawing process the brass must be annealed several times as the metal becomes brittle by continued hammering and would crack and split instead of flowing to the desired form.

The annealing is accomplished by a gas torch, the flame of which is directed upon the metal by the operator whenever it shows signs of losing its plasticity. After being heated to redness the brass is cooled by applications of a wet cloth, as of course any attempt to work this metal while hot would result in immediate fracture.

There are numerous operations upon the cases that are performed by hand, such as putting on the reservoir and filler and soldering in the inlet aud outlet passages. Finished cases are shown in Figs. 13 and 14.

The cases and cores are brought together as shown in Figs. 15 and 16 for the final assembling operation, where all joints are rendered water tight by hand soldering.

What is practically the final operation in the building of a radiator is the testing and inspection shown in Figs. 17 and 18. The assembled radiator is placed on a movable platform in a wooden tank large enough to allow it to be completely submerged in water, and a flexible hose connection made from the filler *A*, Fig. 17, on top of the radiator to a source of compressed air supply.

The wooden platform can be moved up and down by means of the lever *B* through a distance greater than the thickness of the largest radiator, and the tank is filled with water nearly to the level of the platform in its highest position. The pressure on the air mains is maintained at 12 lb. per sq.in.; thus when a radiator is properly connected, the air turned on and the radiator submerged by moving the lever, any leak that may exist will be detected by the presence of air bubbles.

The operator marks the places where escaping air is observed by inserting small bent wires, or "flags," into the tubes nearest the leak, and when thus marked he raises the radiator above the level of the water by a movement of the lever *B*. Cutting off the air supply and releasing the pressure within the radiator by turning the stop and waste valve with which the air connection is provided, he then selects a soldering copper from among a number of various sizes and shapes that are kept heated in a gas furnace ready to his hand, quickly closes the leaks and again submerges the radiator. When he is satisfied that no more leaks exist he calls the inspectors, who examine the radiator while under water and either call the operator's attention to leaks that he has overlooked or, finding none, put their O.K. on it and it is ready for cleaning and packing.

The cases of radiators for automobiles are polished and buffed, and in some instances plated, while the core is treated to an application of black enamel, all for the purpose of securing a neat and finished appearance, but this adds to the expense of production and the enamel in the air passages of the core reduces to some extent its efficiency. Other radiators used for special purposes are not enameled. Before being packed for shipment all radiators are set up on large draining tanks and a current of water allowed to pass through them for several hours, thoroughly washing out the interior and assuring that no foreign matter remains to clog or close their passages after they go into service.

FIGS. 17 AND 18. FINAL SOLDERING AND TESTING OPERATIONS

Extracts from Chordal's Letters

Without doubt there is no other occupation so full of inventive lore, and naturally so, than machine designing, and of the hundreds of devices that are used to lighten the toil of man there are few that cannot claim a "past." The late Professor Sweet used to say that the only fault he could find with the ancients was that they had stolen all our inventions. In this letter Chordal justifies that statement by telling about some "inventions" that had been invented before. He also tells of his new-idea skate clamp, of Jimmerson's varied experiences and of an old-time machinist who cut threads with a hand chaser and used other hand tools skillfully.

Mr. Editor:

* * * A man invents something which he knows the world neds. He goes to his patent solicitor and places the matter in his hands and, lo and behold! the Patent Office comes back and proves the thing to be as old as the hills, a dozen old patents showing the same thing, each of these old patents directing itself to some minor improvement. The man is disappointed and unsatisfied and he wants to know why the thing has not been on the market, for he knows that it is not on the market and knows that it ought to be.

* * * Perhaps the old thing was invented before its time, before the world was ready for it; perhaps the old inventors did not have the money to push the thing; perhaps they put the matter before manufacturers who said there would be no market for the thing; perhaps one of these old inventors thought he ought to have a million dollars for his patent, while nobody would offer him more than five hundred dollars for it; perhaps he died waiting for the million-dollar offer. However all this may be, our new inventor will, to the day of his death, always consider himself the first and original inventor of the affair, but will lose interest in it in view of the fact that there is no glory to be got out of the thing.

* * * This reminds me that when I was a boy we fastened on our skates with straps, and I thereupon was guilty of my first invention—skates with clamps and no straps.

* * * I made a boy's drawing of the thing and was told that it was worthy of a patent. I accordingly hied me to New York and went to see Mr. Munn, with whom I was well acquainted, and whose office I had frequently visited. I knew he had a roomful of models which had accumulated for years, and in that room I had spent many happy hours.

* * * I knew these old models were junk, and after explaining my skate invention to Mr. Munn I asked him for permission to hunt in his model room to see if I could not find something to serve as the foundation for my new model, for the Patent Office required models of inventions in those years.

* * * Mr. Munn turned me loose in the model room, and in pawing over things I came across the model of a skate, which would not answer as the foundation for my model but which was the exact thing, every little detail was present. That was the end of my invention which was going to revolutionize the skate art.

* * * It is strange how inventions fall out of date. In the early days of the telephone a certain telephone company was groping its way to something fairly efficient in the way of central-office apparatus. Jimmerson was consulted by the company, and contrived something in the way of a switchboard very much better than anything the company had thought of, and the company was always in advance.

* * * Jimmerson patented his new switchboard, and Jones Bros. made some of them for the company and they were installed and proved to be far better than anything else in that line.

* * * The company gave orders for a lot of the boards to equip all their central offices, and Jones Bros. booked orders for a lot of the switchboards to go all over the world.

* * * Before the new boards were well under way, however, Scribner, I believe, invented the multiple board, and when Jimmerson looked into the matter he felt compelled to advise the telephone company that this multiple switchboard was so far ahead of what had been contemplated that the only thing to do would be to adopt the multiple switchboard and scrap the Jimmerson switchboard. And that was the end of Jimmerson as a switchboard inventor. Invention had run ahead of him.

* * * Another time Jimmerson tackled the bevel-gear proposition. The shop made chain bicycles by the thousands when there arose the craze for the chainless bicycle, an affair employing a fore-and-aft shaft bevel-geared to the crank and to the rear wheel. Every manufacturer was changing or proposed to change to the chainless, and it was a question of getting the machines for cutting these bevel gears.

* * * Mr. Whitney looked into the matter and planned the equipment and said it would take 18 months to deliver the outfit.

* * * Jimmerson struck on the idea of bevel gears made true to form by a drop-forging process. His idea was to drop-forge a gear with the teeth excessively high and thin, then pickle these forgings and, I believe, do the machining on them; and then to submit them to a second stamping with accurate dies which would squash the teeth downward and thicken them. These finishing dies employed in rendering teeth shallower and fatter were formed with special accuracy, and the work they were to do was comparatively light.

* * * Jimmerson tried the thing out and said it was all right, and he went to the trouble of taking out a patent on the process. And when all this was done the gearless bicycle had to go out of fashion and Jimmerson had all his trouble for nothing. Here was

a case of invention running ahead of the demand, but uselessly so.

* * * Once when I was a young chap working in a country shop a fellow by the name of Farnsworth turned up hunting a job. He was about forty years old and seemed a very nice gentleman, claiming to be from Montgomery, Ala., and to have worked on some nice engine there which had been exhibited at the Crystal Palace in New York and had received honorable mention. His story was undoubtedly true and he proved to be an expert workman.

* * * When the boss hired Farnsworth he set him to work running a lathe, about twenty inches swing, as I recollect it. His first job consisted of a lot of ½-in. capscrews with bodies about 1½ in. long. Nowadays the boss would be buying these screws from some screw factory, but in those days they were all homemade from forgings and finished up in the lathe. Farnsworth centered them and first faced the heads and then put on a carrier and turned their bodies. Everything he did he did in a masterly manner, showing that he knew just what he was at.

* * * There were about three dozen of these screws, and I, as an onlooker, supposed that of course Farnsworth, having finished the turning of these screws, would put on his change gears and proceed to cut the threads. But he did nothing of the kind. He went to his tool kit and fished out a chaser and tried it against the tap which was to be employed and found it correct to a tee-y-ty. Then he proceeded with this hand chaser to thread all those screws, and then as he finished each one, he would pick out of his tool kit another hand tool and would chamfer off the first thread.

* * * Farnsworth made a good job of these screws, but for the life of me I could not see why he did not cut their threads in the usual way in the lathe. His explanation, unsatisfactory to me, at the time, was that that was the proper way to thread those screws; that it made a better job, and that it was quicker. I have never arrived at a full appreciation of Farnsworth's explanation. I understand that a lathesman who is skilled with the hand chaser, as Farnsworth was, could get a more shapely thread than would be produced by a V-pointed tool, and that there was something specially nice about the way the screws would fit. As far as the time was concerned I have never satisfied myself, while recognizing the fact that Farnsworth did this chasing while the work revolved comparatively fast and there was no need for stopping the lathe or running the tool backward. And there certainly was a change in the condition of the first thread, something that always makes trouble with screws cut in the lathe. Farnsworth's first threads were free from this disadvantage, even before he chamfered them off.

* * * Farnsworth was great on picking up a hand tool of one kind or another, and he had lots of them in his tool bag, and doing a little rounding here or a little digging there without bothering himself to change the tool in his toolpost. If he had a 2-in. shaft to have a journal reduced to 1½ in. on one end he would do as you or I would do in reducing this journal, but when it came to squaring up the shoulder or killing the corner on the end of the journal he would speed up his lathe and bring out one of his hand tools. And he was such a master with the hand tool that if he had a little stem to turn with a button on one end of it he was just as apt as not to do the whole thing with hand tools, tackling directly a rough forging or a rough brass casting.

* * * All of us have used hand tools once in a while, as where we wanted to turn up a ball or something of that kind, but we did as little work as possible with such tools, doing the main roughing to shape with the regular lathe tool. We never mastered the art, as Farnsworth did, of making a hand tool do business and deliver nice chips in roughing out work that was eccentric to start on.

* * * I wrote you a short time ago something about a variety of planers I had come across from time to time, but my mind goes back to a planer to plane about 3 ft. between the housings, the planer having been made, if I remember correctly, by the Industrial Works, the old Bement & Dougherty concern in Philadelphia. This planer was in the shop of the St. Joe Railroad Co., and may be there now for all I know. The planer was all right in every respect, and so long as I ran it I never knew it to make a miscue in reversing or in feeding. But the peculiarity about this planer was in the design of the bed. It was closed across the top, between the Vs, and had only a mortise up through which stuck the bull gear. This closed top was nicely finished, and I suppose the idea was to form the bed into something more like a complete box girder than is found in the usual style of planer beds with their two Vs joined by cross-girts only. This was the only planer I have ever seen with this style of bed, and I have often wondered if there were many of them made.

* * * This reminds me to ask you if you can give any good reason for constructing a planer bed with two Vs. It does seem as though one V would be all-sufficient, the other planer way being merely a flat one. I believe this is the plan followed in the concrete planers made in Chicago for planing the beds of gun lathes.

Very respectfully,

CHORDAL.

Wick Oiling Journal Bearings

BY H. K. PORTER

About twenty-seven years ago I made from original drawings an emery grinding machine weighing about 200 lb. It is of the usual type, having two pedestal bearings with the pulley between, and it carries an 80-lb. solid wheel on each end of the 2⅛-in. diameter shaft. The machine has a very efficient exhaust system, using the hollow base as a settling chamber for dust and metal from the work. This grinding machine has been run at least one-half of the time since it was made, and it is now and has been for years running nearly all the time.

The bearings are oiled by felt wicks about 1½ in. wide and ¼ in. thick, which touch the bottom of the shaft. They have oil reservoirs cored in the pedestal holding about 1 pt. each. The lower half of the bearings proper are also produced by coring, are integral with the pedestal and are surrounded by a rim (not touching them) with a semicircular notch at each end

to fit the shaft with a little clearance. The cap is secured to the lower half of the bearing by four cap-screws and located by four dowel pins. A cast shell of suitable shape is held in position by two dowel pins and a machine screw in the cap over the bearing to keep out dust.

Four collars are on the shaft; those at the outer ends of the bearings are the working collars and those at the inner ends are held against the ends of the bearings by weak springs and rotated by pins in the shaft and keyways in the bores of the collars. The working collars are screwed on the shaft and have a step adjustment of about 0.003 in. All the collars are of course inside of, or under, the top shell, or cover, and they no doubt act as centrifugal pumps to draw the oil out of the bearings and cause a rapid circulation. Suitably bent shields are secured to the ends of the bearings to prevent the oil from the collars from getting on the inside of the cover and running out of the joint between the cover and the top, or rim, of the pedestal.

No oil gets out of the bearings; no dust gets in. The same oil is in the bearings that was put in when the machine was set up (costing at that time 15c. a gallon), except that 10 years ago, when some grinding was done on the side of one of the wheels, the soft-steel collar at that end cut a little on the end of the bearing. After examination it was decided to counterbore the ends of the bearings and run in babbitt to take the thrust. The oil was drawn out of the bearings through screw holes in the front of the pedestals and was saved.

After the babbitt thrusts (about $\frac{1}{16}$ in thick) were in place the reservoirs were washed out, as some chips had got in them, and the old oil was put back. Whether any new oil was put in I do not remember, but if so it was only a little.

The only other time anything has been done to the bearings was about six months ago when the bearings got too warm and somebody put some oil into them—enough so the bottom of the collars was in the oil, causing it to splash, and the oil came out of the joint between the cover and the top of the pedestal. I knew there was all the oil in the bearings that was ever put in them, and an examination showed that the wicks had either slipped down or worn away and lost contact with the shaft, thus stopping the feed. This was no doubt the cause of the trouble 10 years ago.

Amount of Wear

The wicks were fixed, the surplus oil was taken out of the bearings and they were all right and are so now. At this time I tried to take one of the writing-paper shims out of the bearings, but I had to put it back again as the shaft could not be turned at all. The only other time any shims have been taken out of the bearings was when the babbitt was put in the ends of the bearings, when one thickness of writing paper only was taken out. The bearings are of hard babbitt metal. They are always a little warm when running as they are insulated by the air inside the shell and are only connected to the pedestal by two posts that measure about 3 x 1 in.

No other than a wick-oiling bearing ever has or ever will make such a record as this—about 4 cents' worth of oil in 27 years, and good for 27 more. If all machines were made with such bearings we would have oil to burn. It proves what some engineer (I think one of the Sellers) said: "If a bearing is well made and large enough, the surfaces never touch if it is kept perfectly lubricated at all times."

Ring oiling bearings seem to be standard equipment now. But when the oil gets dirty in such a bearing the ring keeps it stirred up and feeds dirty oil to the bearing. No dirt can pass through a felt wick and there is nothing to stir up the oil in the reservoir. Any sediment from the oil or the bearing can settle to the bottom and stay there, while the wick draws a clean supply from the top of the oil.

If any of your readers think they can beat this record they had better start at once as it will take them some time to catch up—the old machine is still going.

I have read the *American Machinist* for more than 40 years and it is still going strong. Long may it continue to go, and stronger every year.

A Gage Joke

By E. A. Dixie

Every once in a while the wandering mechanic runs into a mechanical joke, but seldom does he encounter a gem like the following:

Early in the world war a shop in Canada was particularly successful in producing 18-lb. shells. The reputation of the engineer of this plant caused him to be the recipient of many inquiries as to his methods, but besides being an exceptionally efficient engineer he is quite a joker, though this side of his character is not so well known.

One day the superintendent of another plant said to him:

"We are having a lot of shells rejected because of the nose thread. It seems impossible to get our men to work to such close limits. How do you handle your nose threads, and especially how do you arrange your go and no-go gages?"

The thread he referred to was 14 per inch Whitworth female, about 2 in. in diameter. The gage used was threaded at both ends, the no-go end being 0.007 in. larger than the go end.

The engineer feeling in a jocular mood replied:

"Oh, we got around that trouble in a very simple manner. We thread the go end of the gage 14 threads and the no-go end 15 threads."

Several weeks later the telephone on his desk rang and the superintendent of the other shop said:

"Mr. Jones, I just called you up to thank you for that tip you gave me the other day."

"What tip?"

"The one concerning the limit gages for the nose thread."

"I don't remember. What was it?"

"To make the go 14 threads and the no-go 15 threads."

"For the love of Mike, man, you don't mean to tell me you thought I was serious?"

"Of course I did, and the results justified me. We haven't had a rejection since the new limit gages were made."

"Well," said Jones, "the best thing for you to do is to call in and destroy those gages just as quietly and quickly as you can. I was only joking and had not the faintest idea that you would take me seriously."

A Modern Can-Making Plant in a Baking Powder Factory

By J. V. HUNTER
Western Editor *American Machinist*

The manufacture of tin cans is one of the large and important industries of the day. The importance of this enterprise is greater than before the war because enormous quantities of food products are now being canned for export to our troops and Allies, which previously were preserved by refrigeration.

IN SOME respects for a long time can making has been almost a closed monopoly, but in recent years independent makers of can-making machinery have perfected equipments for use in private plants that make it one of the most important branches of manufacture.

The public has very little conception of the vast quantities of tin cans used in the preservation and shipment of food products, but as everyone has seen numbers

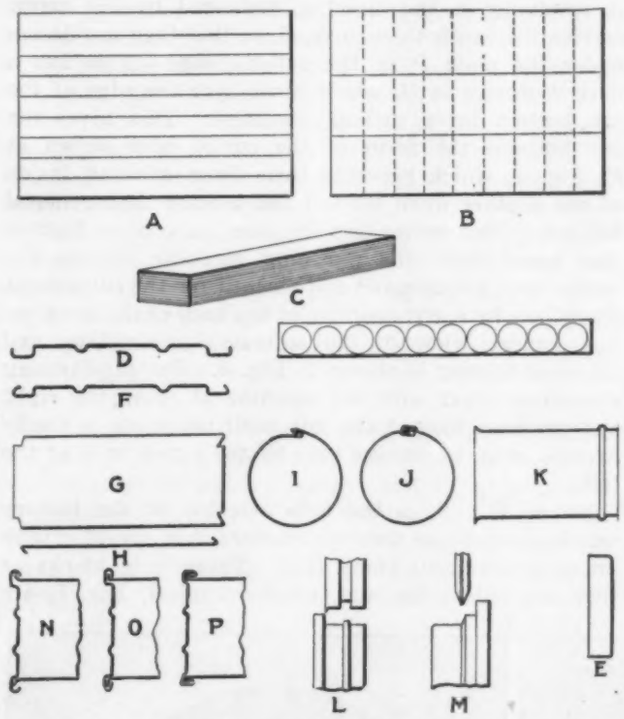


FIG. 1. OPERATIONS IN THE FORMING OF A CAN

of these containers in his own kitchen he will realize how great is the bulk of each for its very slight weight.

The great number of cans that are being manufactured in central factories and shipped to the canning plants, with their great bulk in relation to their weight, are doing more than their share to occupy car space and help congest traffic. Some canners have realized the high cost of transporting, packing and handling tin cans and have found a solution of the problem by manufacturing their own cans.

One of them is the Calumet Baking Powder Co. of Chicago. Three years ago it established its own can-making plant, and since then it has been making additions in order to take care of its growing business. One of the owners stated that the company is using about 7,000,000 lb. of tin plate a year, which would occupy about 125 standard freight cars for shipment and when made up into cans and crated would occupy not less than 600 such cars. This gives a rough idea of how important the can-making industry has become today to some of our packers.

When the Calumet Baking Powder Co. entered into the manufacture of tin cans it contracted for a complete can-plant equipment and its success is the production of cans at a labor cost of something like 73 cents a 1000 cans.

Since the erection of the first can-making unit the increased business of the plant has necessitated additions, until now there are six complete automatic units.

The line drawings, Fig. 1, have been prepared to show the successive stages through which the sheet-metal passes in the many operations that bring it to its final

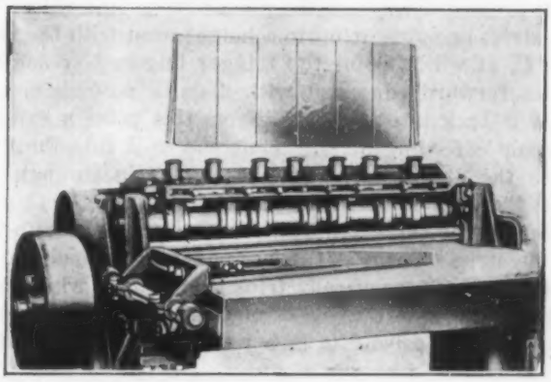


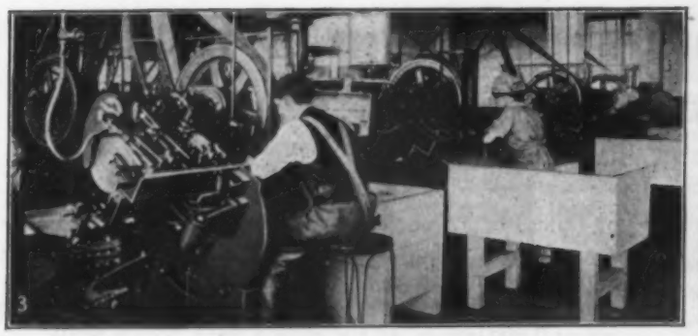
FIG. 2. ROLLER-SLITTING MACHINE FOR CUTTING TIN PLATE IN STRIPS

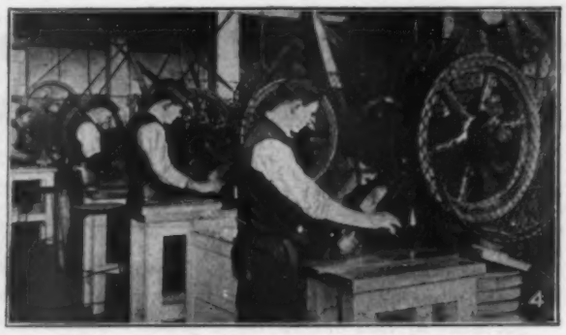
form. Constant reference will be made to these diagrams in connection with the description of the work which each machine performs.

The first operation on the tin plate is shown in Fig. 1 at *A*. This is a slitting process that is performed on the machine shown in Fig. 2. It shears and slits standard sheet plate in suitable width for punching tops and bottoms of the cans. At *B* another sheet is shown with the solid cross-lines indicating the first, and dotted lines the second slitting operations to obtain pieces for the can sides.

The automatic punching machines for forming tops and bottoms of the cans are shown in Fig. 3 and hand-feed machines for special work in Fig. 4. Since the photograph was taken most of the operators have been replaced by women, who are now doing much of the machine feeding.

Some of the punching machine details can be better understood from Fig. 5. The sheet strips as they come





FIGS. 3 AND 4. AUTOMATIC AND HAND-FEED PUNCHING MACHINES
Fig. 3—Shop view of automatic punching-machine battery. Fig. 4—A line of hand-fed presses used for special ends and tops

from the slitter are piled up in stacks as shown at *C*, Fig. 1, and in this form they are delivered to the operator of the punching machine, who makes sure that the edges and ends are evenly piled and places them in the receptacle shown at *A*, Fig. 5. The stop *B* is adjustable for different lengths of strips.

The feeding arrangement has its essential member in the part *C*, which is a vacuum cup. There are four of these cups mounted on the ends of pipe through which air is drawn to create a vacuum. They are moved up and down by a lever on the back of the arm *D*. The vacuum is created by a pump driven by the crankshaft of the punching machine as shown at *E*, Fig. 6.

By means of suitable cams a lever attached to *D*, Fig. 5, rises with the vacuum cups, which have previously been pressed down onto the pile of strips and raises the top strip, bringing it up to a height even with the dark slot *F*, at which point the trigger fingers *G* reach out to its forward edge and with a quick feeding motion draw it back into the slot. From this point a suitable automatic feeding arrangement passes it into the dies.

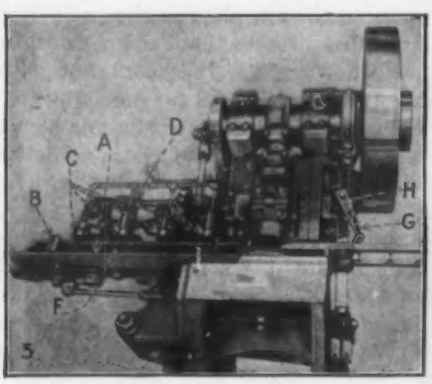
As the strip nearly completes its trip through the dies, the lever *H* moves to the left and the little trigger finger on the end catches into one of the holes punched in the strip. Then, as the last punching is made in the strip, a cam automatically trips the lever *H*, which with a quick throw to the right removes the strip and gives it a fling, depositing it in a waste box at the right of the machine.

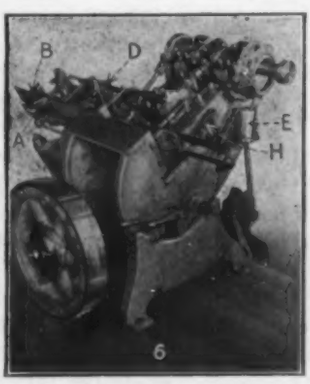
The work of this punching machine is entirely automatic, the duty of the operator being to see that nothing clogs the dies and to feed piles of strips into the receptacle *A* at the time when the vacuum cups are raising the top sheet, leaving room for the insertion of a fresh pile. The construction of the automatic feeding arrangement is such that the machine never makes a blank stroke unless the receptacle is empty. The capacity of the machine is 150 bottoms or tops of cans a minute.

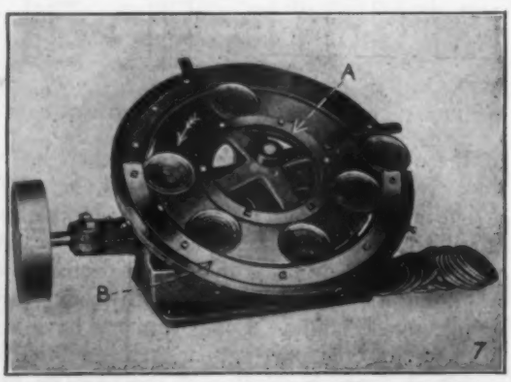
The combination dies will either form a bottom of the shape shown in the section at *D*, Fig. 1, or punch and draw the top as shown at *E*. When making bottoms the die automatically ejects them and they slide down and out from the back of the press. Here they fall into the automatic edge-turning device known as the curler, shown in Fig. 7. The central wheel and disk *A* revolving in the direction indicated by the arrow carries the can bottoms around, so that they are drawn under the plate *B* in the outside edge. This has a narrow groove in it, which turns over the edge of the can bottom by a curling operation. This gives the can bottoms the form of the curled edge shown at *F*, Fig. 1, which prevents them from sticking inside of one another when stacked and making their removal difficult. This curler handles the bottoms as fast as they come from the punching machine. From the curler they are removed and stacked for the subsequent operations by a girl operator at the back of the machine.

A general view of the automatic can-making and conveyor battery is shown in Fig. 8. The can-forming operations start with the machine at *A* on the right and progress toward the left until the work is finally carried away to storage bins by the conveyor *G* at the left.

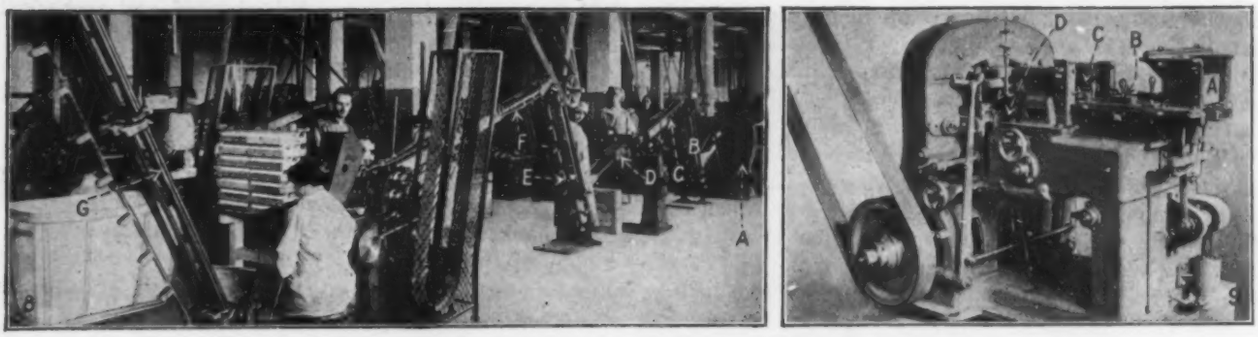
At *A*, Fig. 9, is the first machine of the battery which is known as the lock seamer; it is provided with an automatic body-blank feed. These body blanks as they are slit to the size, as shown at *B*, Fig. 1, are







FIGS. 5 TO 7. FEEDING AND EDGE-CURLING DEVICES AND AUTOMATIC PRESS
Fig. 5—Feeding device of automatic punching machine. Fig. 6—Automatic press showing scrap discharge and suction pump. Fig. 7—Edge-curling device to prevent stacking



FIGS. 8 AND 9. AUTOMATIC CAN MACHINE AND LOCK SEAMER
Fig. 8—Automatic can machine and conveyor line. Fig. 9—Lock seamer for forming can bodies

placed on the feeding table at *A*, Fig. 9. The automatic feeding device *B* pushes the blank forward between suitable slides to a position about at *C*, at which point certain notches are cut into the end as indicated at *G*, Fig. 1, these notches being for the purpose of preventing too much stock for the seam at these points. As the blank is automatically moved forward through this machine it reaches a point about at *D*, where two forming devices, one at each end of the sheet, bend one end up and the other end downward, making two reverse hooks as shown at *H*, Fig. 1.

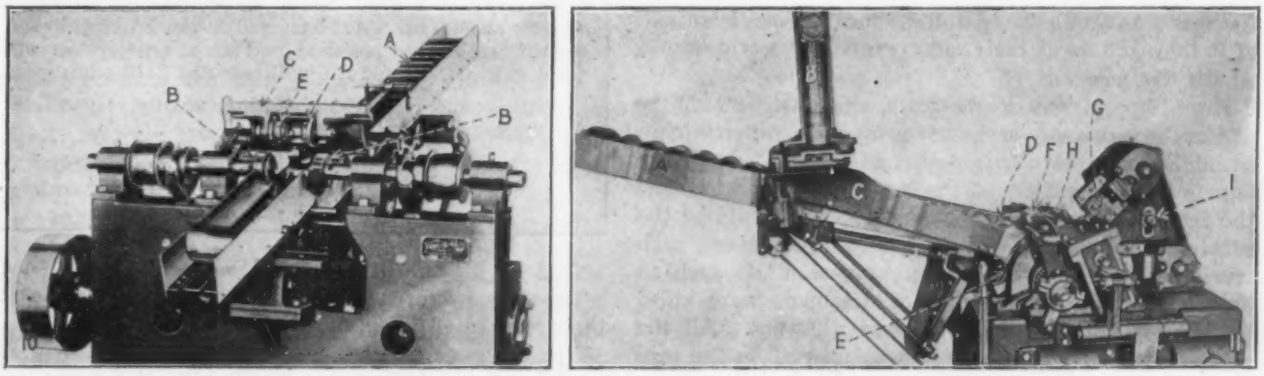
The body blank is then slipped forward above a mandrel, which is a round collapsible form of the size of the finished can body. Two folding arms operating from over this mandrel close around it the blank and bring it into a circular form and at the same time the two hooks are brought together as shown at *I*. These hooks are ready for forming the double seam, and a die on the machine in Fig. 9 is brought down on this joint with a blow, forming the double seam in the joint seen at *J*, Fig. 1. At this point the mandrel collapses slightly and a set of stripper fingers pushes the formed can body from the mandrel onto the conveyor, which carries it to the next machine. The speed of this machine is from 100 to 125 can bodies a minute.

As the can bodies come from the machine they fall into the conveyor shown at *B*, Fig. 8, and are hoisted to a point from which they can roll by gravity into the magazine *C*, which feeds the next machine at *D*. This is known as the beading and flanging machine, and is shown in greater detail in Fig. 10. Its work is to form the bottom flange on the can, as shown at *K*, Fig. 1, and at the same time roll a bead which stiffens the top of the can and forms the shoulder, against which the cover of the can will be closed.

At *A* is the magazine end of the automatic conveyor which feeds the cans to the machine. As the can body enters the machine the two end chucks *B* spread apart to allow the can to roll between them. They then close securely holding the can in a central position, and while revolving rapidly part *C* of the machine is lowered, bringing the roller *D* in contact with the can, forming a bead by pressing against another small roller on the inside of the can body. The flange on the bottom of the can is formed by the pressure of the roller *E* at the left. The correct idea of the operation of these rollers can be obtained from Fig. 1, where the rollers *L* for the bead and *M* for the flange are shown. The machine handles these parts as rapidly as they are fed to it from the conveyor and must take care of the whole production of the lock seamer or congestion would ensue.

The flanged and beaded can bodies again fall into the conveyor, where at *E*, Fig. 8, they are elevated to a point so that they can roll down into the magazine *F* of the next machine. This last machine of the series is known as the automatic double seamer for can bottoms and does all the final operation for putting the can body into condition ready for filling. The details of this machine are shown in Fig. 11.

The can bodies are fed into the magazine of this machine at *A* while the can bottoms are put in the vertical magazine *B*. From this vertical magazine, by means of an automatic feeding device, one can bottom falls into the chute *C* as each can body is fed forward into the machine. This chute *C* holds the can bottom in an upright position and it is fed down to the point



FIGS. 10 AND 11. FLANGING AND SEAMING MACHINES
Fig. 10—Bottom-flanging and beading machine. Fig. 11—Double seamer for placing can bottoms

D where positive stops line it up in position with the can body. The automatic conveyor *E* that carries the cans through the operations of this machine has notches cut in it, and as it revolves one of the can bodies falls into each notch and a corresponding can bottom lines up in position with it, being pressed into position as it advances to the point *F* where it assumes the form as shown at *N*, Fig. 1. The conveyor wheel then carries the can forward under the roller shown at *G*, Fig. 11, and at the same time the two ends of the can are gripped by means of chucks in the housings *H* and *I*. The chucks revolve at high speed, spinning the can and bottom around in contact with the roller *G*, which presses the seam into the form shown at *O*, Fig. 1, and then rocks back while another similar roller not seen in the cut comes forward and presses the double seam down into its final shape as shown in *P*. This completes the operations on one can body and the wheel conveyor revolves through one more notch with the next can while the completed body falls through into the conveyor below.

The conveyor shown at *G*, Fig. 8, is carrying the completed can bodies from this final machine operation over into the storage bin. The woman shown at this point is inspecting the can bodies as they pass through to be sure that there are no defectives. The operation of the bottom seamer is at a speed commensurate with that of the preceding machine operation, so that there shall be no congestion.

A feature that impresses the visitor to this plant is that cans are made by the different machines performing all the operations mentioned at a rate of nearly two a second for each unit system.

Letter from Young Dixie to His Dad

West Front.

Dear Old Dad:

It's the little things that count. This whole campaign has been successful because of the perfect coördination of an infinite number of details—little things in themselves but in the aggregate irresistible.

Who can tell the ultimate result of a little cause?

Bulgaria gave in, Austria and Turkey flopped, but the Huns decided to fight on. Now, dad, this is *inside information.* We had run a long, thin wedge—hundreds of thousands of men—into the Boche. On both sides of us their infantry was pushed back, but behind their infantry, on both of our flanks, their artillery stretched for miles and miles. Had they only taken advantage of it they had us at their mercy—and the world knows what their mercy is! * * *

Herr General von Schweingutz, chief artillery officer of the German army and most profound mathematician in all Europe, sat at his desk in Grand Headquarters figuring the elevation of the guns that were to blow the accursed Yankees into eternity. This would be the turning point of the war. Colonels, captains and such truck could be trusted to figure unessentials such as barrages (what matter if a few Germans were killed by German guns?); but this was different. All the guns on the west front were to be trained on the thin wedge of Yanks and obliterate them.

At length the general's work was done, the elevation had been accurately computed, checked and rechecked by the supreme mathematical brain of the world.

The figures stood "15 deg."—accurate to a fraction of a second of arc. The figures as set down were sent to be multigraphed for issuance, and on the way the little thing happened. * * *

Here there are a lot of insects on your west front if you are facing East, but no more than there are on both flanks and the other front—and flies, like the plague of the Egyptians! The insects—the others and the flies—are nonpartisan. They light on or bite the

just and the unjust—Yank, English, French or Hun, it's all the same to them, and that's the reason why a fly lit on that general order sent out by the chief of artillery, and deposited a little round speck between the *1* and the *5* of the 15 deg. indicating the elevation of the guns. It looked just like a decimal point, that is, 1.5 deg., and as such was copied in manifold and sent broadcast to the Boche artillery officers. * * *

IMPERIAL GRAND HEADQUARTERS

GENERAL ORDER—VERY IMPORTANT

To all artillery officers in charge of operations on the west front:

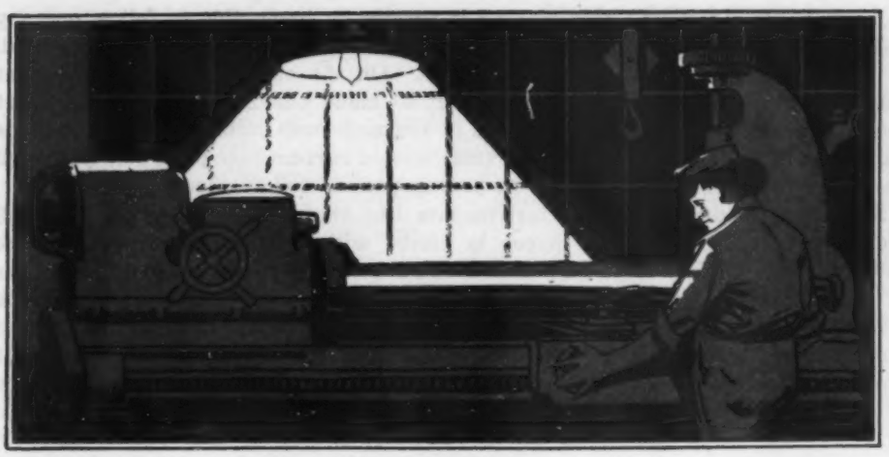
Promptly at 2 p.m. (Berlin time), Nov. 7, all guns 77 mm. and larger will be trained in the general direction of the Yankee positions and set at an elevation of 1.5 deg. *exact.* Rapid fire will begin at 2:10 p.m.

Artillery officers will be held individually responsible for the carrying out of this order.

Von Schweingutz,
Gross-Ober-Haupt-General.

And so it's the little things that count, a fly speck between two figures caused a thousand gunners to set their guns at 13.5 deg. *too low* an elevation.

The shells never reached our men, but blew h—l out of the German infantry on both sides of us, and now the war is over hastened by a misplaced flyspeck.



LIGHT, ELECTRICITY and The Shop

By C. E. Clewell

Making Accurate Power Charts in the Shop

This article explains the place held by graphic records and the instruments with which they are made. Several types of electrical graphic meters are described and simple circuit diagrams are used to illustrate methods of making connections between such instruments and the electric circuits on which the measurements are to be made. To bring out the practical uses to which the graphic meter may be put a case of the work done in a Cincinnati motor-driven planing machine is employed. This work consisted of a lathe bed, and graphic records for both short and long cuts are shown and analyzed. These charts are also used to bring out the many interesting conclusions which may be drawn from such records in a way which would hardly be possible from observations of the operation on a machine tool.

THE ease with which measurements may be made on electrical-supply circuits is a matter of fairly common knowledge. For example, the amount of power which is required by a direct-current motor operating a lathe may be measured at any instant by connecting into the circuit that furnishes current to the motor a voltmeter and an ammeter, taking a simultaneous reading of each instrument and multiplying the two readings together. This result, if divided by a constant equal to about 746, gives the horsepower input to the motor at the instant the readings on the two instruments are made.

It should be noted, first, that such a measurement of the power put into a device by the simple observation of the needles of one or two electric meters is a far more simple method of making such a measurement than the usual corresponding measurements in mechanical power-transmission systems; second, that such electric measurements may be very accurate if the instruments are properly calibrated and the observations carefully made; and third, that the method of taking these observations gives merely an idea of the conditions at the instant for which the readings on the meters are made. Instruments which indicate conditions at a given instant only are called the indicating type to distinguish them from the so-called graphic type about to be described.

Suppose in the foregoing example that the power required by the motor fluctuated over wide limits because of changes being made in the work done by the machine tool. To make a measurement of the power taken by the motor at a given instant does not give an idea of the limits over which the power is varying, and it is here that the type of instrument that makes a record fills a distinct need. If we substitute for the indicating ammeter in the above case a graphic ammeter, and assume that the voltage, or pressure, of the supply circuit is constant or practically so, then a means is provided for tracing out a record of all changes of the current and power taken by the motor, so that an inspection of the chart shows not only the average demands on the supply circuits but such peaks, for example, as may be caused at the point where a planing machine reverses.

Use of Graphic Records

Instruments for making graphic records have long been in use for such cases as pressure gages, vacuum gages, water-level gages, for recording thermometers, for electric pyrometers and the like, but the purpose of this article is to emphasize the uses of electric-pressure, electric-current and electric-power instruments in the shop equipped with motor-driven machinery in one form or another. It will suit our purposes best, therefore, first to look briefly into the nature of these electric meters of the graphic type.

Graphic electric meters can be purchased either in portable form or for stationary use in some one fixed position. Where such an instrument is employed in a shop for making measurements on a variety of motors or circuits from week to week a portable meter possesses the advantage of lending itself to convenient transfer from one machine to another, although some cases arise in other lines where a record is to be taken at one point over a long period, and here the type which is not so readily portable would serve the purpose.

In Fig. 1 a portable graphic meter is shown, and in this diagram the record which is being drawn on the paper roll is clearly visible, also the handle at the top

of the case.[1] To give such an instrument lightness of weight the case is made of aluminum. The paper is moved at prescribed speeds by clock work, the clock being an eight-day balance-wheel type which is protected by a brass dust-proof case. The chart, shown in Fig. 1, is 6 in. wide, and in this type of meter may be fed under the recording pen at any one of nine speeds which range from ¾ to 360 in. an hour. At present this portable type is made for use on direct- or alternating-current electric circuits.

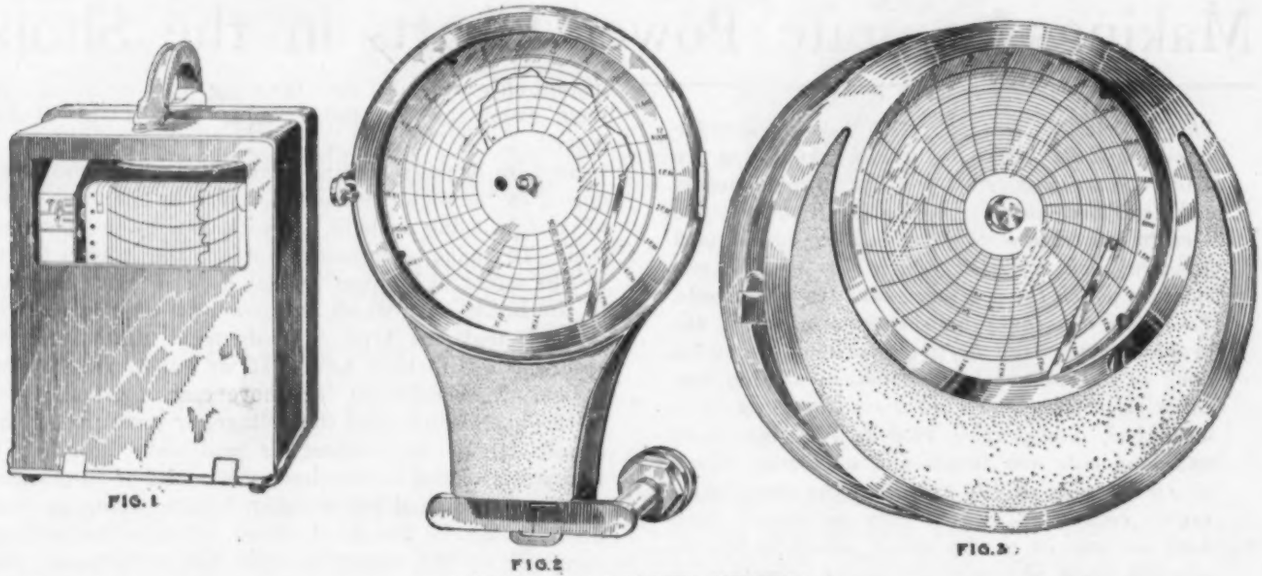
The recording paper in Fig. 1 is apparently a long, narrow strip which is slowly moved under the pen, thus making a continuous record over any length of time, depending on the length of the paper and the rate at which it is fed under the pen. This is a very good arrangement, and particularly so where, because of the very wide and quick variations in the current, for example, it is necessary to move the paper rapidly under the pen so that the pen may follow all changes accurately.

Another form of paper record is shown in Figs. 2 and 3, each of which illustrates one type of the Bristol graphic-recording current-measuring instrument. In these types the chart consists of a circular piece of paper properly graduated for time and for values of current. It is fairly apparent that in such a form of chart the speed with which the paper is moved under the pen is governed to quite a degree by the fact that there is a definite space to the chart which is used up when the paper makes one revolution.

A close inspection of Figs. 2 and 3 shows that the space corresponding to one hour (assuming that the chart makes one complete revolution in 24 hours) is small and that the space corresponding to a minute is thus very small. Hence, wide variations might take place throughout a part of a minute without any clear-cut markings on the chart save a blurred indication, this making it practically impossible to follow out any marked changes in current which take place over small intervals of time. On the other hand, an instrument of this kind set to make one revolution of the chart per 24 hours is unusually well suited to use for records where the variations of current take place slowly enough for the recording pen to follow them clearly.

In instruments like those shown in Figs. 2 and 3 the paper is moved with a circular motion by clock work, and a small pen filled with special ink either presses continuously against the paper or the pen is brought into contact momentarily with the paper so as to make a record in the form of a series of dots rather than a continuous line, in which case the friction of the paper moved against the pen is largely avoided.

In another Bristol recording device the chart is made of smoked semi-transparent paper on which a pen merely makes a dot at intervals. The record therefore consists of a series of dots etched on the smoked surface. After the record is completed, the chart is removed and placed in a jar, Fig. 8, in which the chart is "fixed" by means of a solution, thus leaving the record in permanent form.



FIGS. 1 TO 3. GRAPHIC METERS

Fig. 1—Portable graphic meter. Fig. 2—Graphic meter with circular chart (early type). Fig. 3—Circular graphic meter

In Fig. 2 it will be seen that the pen sweeps over the chart radially with respect to some point within the instrument case, hence the time lines on the chart are curved according to this needle motion. In some graphic instruments rectangular chart paper can be employed on account of a special pen mechanism which gives a parallel motion to the pen rather than a curved motion as in Fig. 2. Figs. 10 and 11 show continuous-roll charts in which a curved line is drawn by the pen as it sweeps across the paper due to sudden current changes. As a result the ruling on the chart paper is not rectangular but curved as far as the time lines are concerned.

To illustrate the simplicity of connecting a graphic meter into shop circuits, the method of making the connections for the ammeter, or current-measuring meter, may be explained. Fig. 4 shows how such an instrument may be connected into the circuit, diagram

[1]This instrument is one of the Esterline type. I am indebted to J. W. Esterline for placing at my disposal valuable data concerning graphic meters and particularly the account of the test shown in Figs. 9, 10 and 11 and as described in the text. Other manufacturers who have furnished important information are the Bristol company, the Westinghouse Electric and Manufacturing Co., and the General Electric Co.

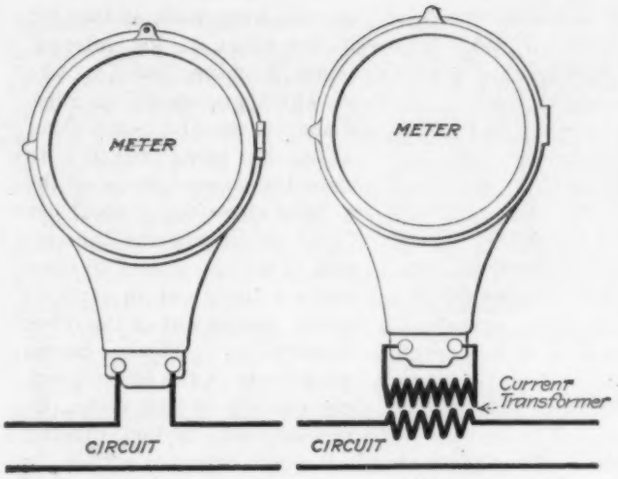


FIG. 4. CONNECTIONS WITH AND WITHOUT TRANSFORMER
A—Ordinary connection. B—Transformer inserted

(a) referring to the insertion of the instrument in the line so that the entire current flowing through the line passes through the meter. Where the current in the circuit is large in value a scheme is often employed for allowing only a fixed part of the line current to flow through the instrument and calibrating the instrument to record directly in terms of the total line current.

In Fig. 4 (b), for example, the meter is not connected directly to the line, but through a so-called "current transformer" which allows only a fixed proportion of the main current to pass through the meter proper. Such a transformer is adapted to alternating-current circuits only. Where this general principle of measuring a certain proportion of the line current is used in direct-current circuits a shunt is employed, as shown to the left in Fig. 7.

Where the pen of the graphic meter is actuated directly by the measuring or meter element and the paper chart is moved by ordinary hand-wound clock work the connection diagram may be simply as indicated in Fig. 4. However, in some types of graphic meters the pen-actuating mechanism and the clock winding is operated by what is known as a separate-control circuit, in which case Fig. 5 may be used as an illustration. It will be noticed in Fig. 5 that the measuring, or meter, element is attached to the main circuit on the left while the control current is fed into the instrument from a special circuit on the right. In certain cases a resistance must be inserted as a protection for the instrument.

Fig. 5 refers to the connections for a voltmeter, hence the meter element is connected directly across the main-circuit wires. Fig. 6 shows a corresponding diagram for an alternating-current (a.c.) ammeter, with the control circuit as in Fig. 5, but with the meter element (the two left wires entering the ammeter) connected to the line through an instrument transformer as in Fig. 4 (b). The direct-current (d.c.) ammeter diagram in Fig. 7 shows the meter element connected to the line through a shunt for reducing the actual amount of current which passes through the instrument proper. The function of the current transformer and of the shunt in Figs. 6 and 7 may not be required where the current to be measured is small in amount, and in such cases the meter elements of the ammeters might be directly inserted in the line, as in Fig. 4 (a).

FIG. 8. FIXING A SMOKED-PAPER RECORD

The foregoing notes relate principally to the physical details of the instruments themselves, and this leads naturally to a closer study of the uses of such meters in shop practice. Where a shop purchases its power from a central station it is important to know not only

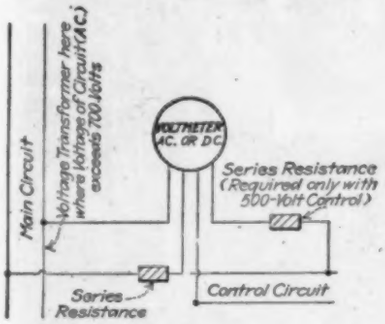

Main Circuit
Voltage Transformer here where Voltage of Circuit (A.C.) exceeds 700 Volts
VOLTMETER A.C. OR D.C.
Series Resistance (Required only with 500-Volt Control)
Series Resistance
Control Circuit

FIG. 5

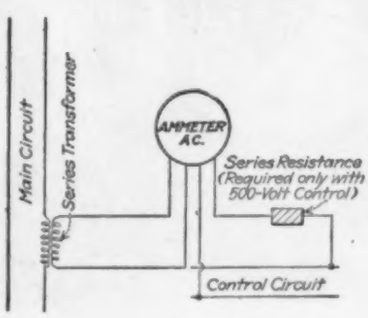


FIG. 6

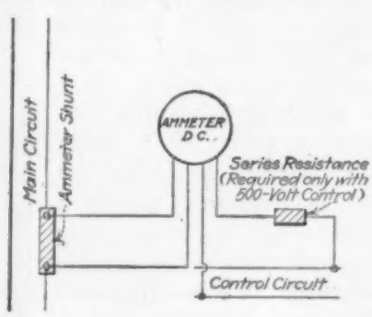
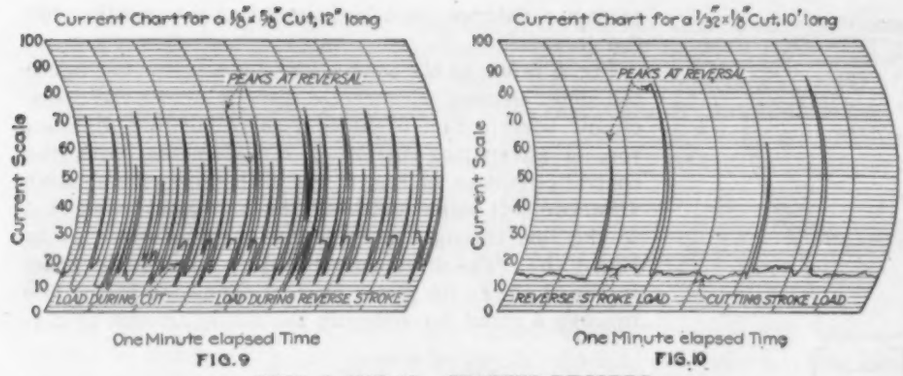


FIG. 7

FIGS. 5 TO 7. WIRING DIAGRAMS
Fig. 5—Connection for voltmeter (either alternating-current or direct-current). Fig. 6—Connections for alternating-current ammeter. Fig. 7—Connections for direct-current ammeter



FIGS. 9 AND 10. GRAPHIC RECORDS

Fig. 9—Graphic record (planing machine on 12-in. cut). Fig. 10—Graphic record (planing machine on 10-ft. cut)

the gross amount of energy used throughout a day or a month but also the maximum demand for current, since the rate charged by the central station is often governed by this maximum demand or the peak in the current requirements from day to day. Here a graphic chart of the gross power taken from the central-station mains furnishes a basis for the shop to know just where it stands in the matter of peak loads, and by a study of where the peaks occur in the day's operation it may be possible by some slight readjustments of motor control or of methods to reduce the peaks and to take advantage of a lower rate of charge for the power bill.

Such records of the gross power requirements of a shop also give the management a basis for studying the way in which the various departments are being handled in the matter of starting work in the morning and after the lunch hour and in the matter of the time of shutting down the plant at noon and at the end of the day.

Probably the most valuable and interesting use of these instruments in shop management, however, is in the study and analysis of the motors employed for driving individual machine tools or groups of machines. Not only does such a record give a basis for such a study but its indications may be used for keeping track of the way in which an operation on a machine tool is being performed and of the losses that may be taking place owing to lack of crane service or other causes. To take a graphic record of the performance of a motor-driven machine tool also sometimes serves to encourage the operator to keep pace with what he considers a fair rate of production for the work he is engaged upon. It is readily seen that a record of the current taken by a motor, which is operating a planing machine, a crane or a hoist, would indicate clearly the general performance of the given machinery. To make clear the application of the graphic instrument to actual shop conditions a case may be cited of the operations on a lathe bed on a Cincinnati planing machine. A number of graphic records were made of this job in the shops of the International Machine Tool Co., two of which are shown in Figs. 9 and 10, the first curve sheet (Fig. 9) being selected to show the general shape of the current curve for a short cut 2 in. in length, and the second (Fig. 10) is used to illustrate a 10-ft. cut in contrast to the shorter cut of the other illustration. These curves were made on the electric-supply circuits of the 20-hp. direct-current motor directly connected to the countershaft which operated a 32-in. by 16-ft. Cincinnati planing machine. The heavy cast-iron lathe bed was worked on at different parts during the tests. Both curves were taken with an Esterline graphic ammeter connected across a shunt placed in the motor circuit (see left part of Fig. 7). The clock used in the motor was selected to give a rapid chart feed so as to produce a clearcut record of the rapid changes which took place in Fig. 9, as an example. In each case 6 in. (horizontal distance) on the chart correspond to 1 min. of time.

Let us examine some of the things shown by Figs. 9 and 10. In Fig. 9, for example, the horizontal distance between the two peaks of reversal shown corresponds to the time interval of the cutting stroke, which is about $\frac{1}{2}\frac{1}{4}$ min. The length of the cut is 12 in., hence the cutting speed is about 24 ft. per minute. The reverse speed is nearly twice this, or approximately 48 ft. per minute, since the time interval between peaks just before and at the end of the reverse stroke is roughly only $^1/_{48}$ minute.

Fig. 9 shows further that the maximum current taken by the planing-machine motor occurs at the point of reversal just after the cutting stroke and amounts to about 70 amp. on the average. This current value, if compared with the full-load rated current of the motor, gives an indication directly of the amount of

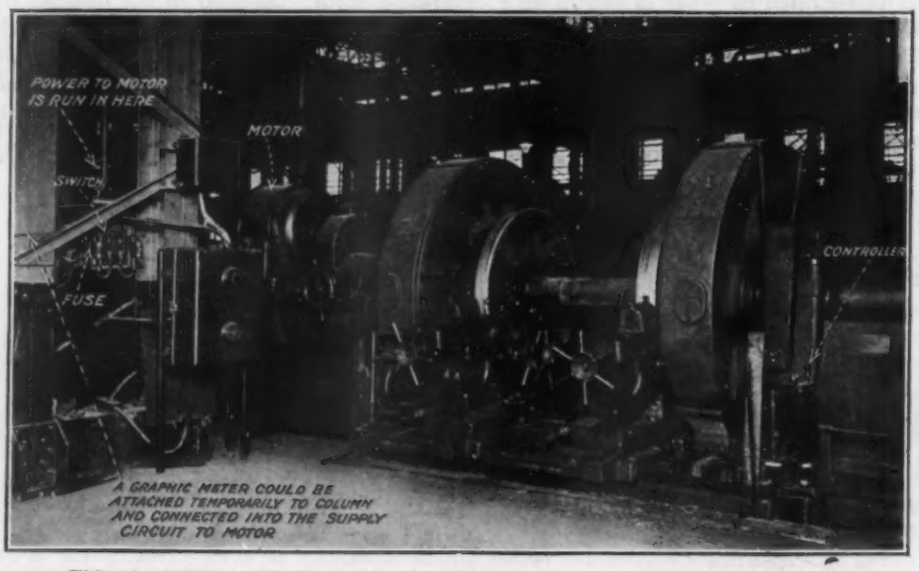

POWER TO MOTOR IS RUN IN HERE
MOTOR
SWITCH
FUSE
CONTROLLER
A GRAPHIC METER COULD BE ATTACHED TEMPORARILY TO COLUMN AND CONNECTED INTO THE SUPPLY CIRCUIT TO MOTOR

FIG. 11. HOW A METER CAN BE APPLIED TO A MACHINE-TOOL CIRCUIT

momentary overload which this motor is expected to carry. The average current during the cutting stroke is about 25 amperes, or about one-third of the maximum. The peak current load just before the return stroke is only a little more than 50 amperes or, roughly, twice the current required for the cutting stroke. The average current during the reverse stroke is roughly 15 amperes.

It will be observed that starting from the right-hand part of the diagram and reading from right to left the chart shows quite a uniform result for about eleven cutting strokes and that then some irregularities occur. The graphic instrument is very sensitive to irregularities in operation, and in thus making a true and accurate record of everything that goes on in the performance of a piece of work gives the management the opportunity of tracing out any recurrent irregularity and to remedy any difficulties which may have arisen in the work.

Turning to Fig. 10 a first glance at this second chart emphasizes how much depends on the speed with which the paper of the chart passes under the recording pen. Thus the cutting stroke is much longer than that in Fig. 9, hence the duty cycle covers a longer time interval. As would be expected, the chart shown in Fig. 10 presents a clearer basis for analysis than that of Fig. 9.

In Fig. 10 the cutting stroke is seen to cover a horizontal distance of 1½-in. The stroke is 10 ft. long, and as 6 in. on the chart correspond to 1 min., the 10-ft. cut has been taken in about one-fourth of a minute, making the cutting speed approximately 40 ft. per minute. The reverse stroke covers about one-half as much time as the cutting stroke, hence the reverse speed is roughly 80 ft. per minute. Here again the current peak at the reversal immediately following the cutting stroke is the maximum and corresponds to about 80 amperes. The average demand for the cutting stroke is only about 15 amperes, or less than one-fifth of the maximum. In this case the average current requirement during the reverse stroke is a little greater than that during the cutting stroke, which is due no doubt to the high speed of the reverse stroke.

The foregoing discussion has included only one extended case of a typical use of the graphic meter. Many others might be cited, but this one interesting case will serve to explain, as an example, the study which may be made of such charts. Fig. 11 is included to suggest to the reader the ease with which graphic records of this kind may be made of the power input to machine tools in general when individual motor drive is employed for the tools in question.

Ordnance Department Work in France

By CAPT. PAUL A. CURTIS, U. S. A.

These observations on the work of the Ordnance Department in France are the result of a trip through the zone of action. They give us a little insight into the tremendous activities carried on back of the lines during hostilities.

THERE is nothing that would so quickly refute the disparaging comments on the Ordnance Department, which were so prevalent a year ago, as a close inspection of the several branches of this organization in France. The men responsible for the remarkable record that the department has established there are the same ones who were the butt of criticism when the administration of the War Department was on the rack last winter.

I have spent several weeks in France in the theater of operation, along the firing line from Soissons to the Toul sector and back through the lines of communication to the advanced ordnance depots, and to the ordnance bases situated at the ports of debarkation on the coast.

No one could have made this trip without being forcefully impressed by the coöperation and unity of the several sections of the Ordnance Department "over there," and the cheerfulness with which the men conducted their ceaseless, monotonous work day and night.

After spending several days along the line and at the railroad heads where munitions and supplies for the troops in the trenches were dumped I had an opportunity to inspect the largest advance ordnance base in France from which the immediately required stores were forwarded to the front and to which the used and unserviceable equipment was returned for renovation.

In this little town, with a population in ordinary times of about 500 people, there were employed 15,000 troops of the technical branches of the service. The major part of the operation was, of course, ordnance, consequently a large proportion of the personnel was ordnance men, most of them skilled artisans detailed to this specific branch of the service because of their ability along a particular line. There were several labor battalions and about 1500 German prisoners at work.

The depot covered an immense area, almost entirely roofed over, in which there were laid 350 miles of railroad tracks. Quantities of ordnance material of every description were on hand to replace immediately supplies that might be lost in case of a reverse. These stores were piled to the roof in buildings so vast that narrow-gage tracks were used to collect them as called for. Yet so orderly was the arrangement that the smallest parts could be shipped in a few hours' notice to the points where they were required. Each little department was as distinct as a separate business organization in a large city, and operated independent of any other department, so that there was absolutely no confliction or delay caused by the usual red tape of a large organization in the issuing of orders.

No less interesting were the repair shops where rifles returned from the front by the thousands were piled like cord wood waiting to be renovated and refitted for service. The serviceable parts were salvaged from the unserviceable arms and used to replace broken or worn parts of repaired rifles.

Hundreds of men were working in this shop refitting, repairing and cleaning Colt automatics, rifles, machine guns and automatic rifles for the front lines.

The amount of ammunition used in this plant daily

in testing and refitting machine guns and automatic rifles alone was astounding, and quantities of German Maxims were put in perfect condition and sent back to be used against their former owners.

In the artillery repair shop, covering probably 5 or 6 acres, guns of all descriptions were being overhauled, there being among them little 3-in. Stokes mortars, 6-in. trench mortars, 37-mm. and 75-mm. field guns, antiaircraft guns, 155-mm. howitzers, and several types of captured German ordnance. Adjoining these were the artillery and ordnance repair schools where men were instructed before being sent out to the mobile repair shops along the line.

The saving which accrued, due to the scientific management of the base depots, was almost beyond belief. So carefully was the salvage work conducted that it is estimated 90 per cent. of the unfit equipment sent to the rear went back to the front as serviceable as the day it was made. Some of it came back time and again with a small percentage of loss.

The work at the base ports was no less creditable. Not only did the material have to be debarked, which was in itself a big problem in the crowded French ports, but in almost every case the facilities for debarking had to be made. The American basin docks at Bordeaux and St. Nazaire are a credit and a monument to American energy and ingenuity.

It is not meant to imply that everything was running in a quiet, orderly fashion, without confusion, in either offices or shops. But as an officer of high rank said in my presence, after inspecting the ordnance line of communication, "A greater amount of order and system would be, to my mind, cause for considerable anxiety, for it would denote a stagnation in ordnance work which would be detrimental to the success of that department at the present time."

In saying this he hit the keynote of the entire situation abroad. We have to remember that the gigantic war machine we created was not to be a permanent organization. It was constructed for the sole purpose of assisting in winning the war. Conditions were continually changing on the Western Front, and as these changes took place it became necessary to make quick decisions and rapid changes in the work being conducted by the Ordnance Department to meet the needs of the troops.

The accomplishments of the Ordnance Department in France are no less creditable than the accomplishments in this country, the value of which the public is at last becoming awake to. A word can be said of the personnel which more than made the maintenance of our field army possible. With untiring energy, without regard for personal comfort or ambition, these officers settled down in little hamlets, practically without any news from the outside, without any of the glamour of active warfare to encourage them to greater efforts, but with the resolve to do their bit and do it in the best way and the shortest time, and built up a monument to themselves and to their countrymen in France.

The officers and men in these plants were practically isolated from all amusement. At the large plant first described there was a motion-picture hut run by the Y. M. C. A., which could accommodate two or three hundred out of the 15,000 men in the camp. With this exception, there was nothing for them to do but the job that they were sent to do.

Had these men been suceptible to petty jealousies and personal ambition the unity and coöperative work in the various sections would have been impossible. The Ordnance Department had the chance to show its true colors and it certainly lived up to its opportunities in the American Expeditionary Force.

Training Returned Soldiers

By A. Kirby

Superintendent of the Training Department of the Russell Motor Car Co., Toronto, Canada

There nave been published several articles by various correspondents on training men as machinists. As we only use returned soldiers who either through wounds or sickness contracted on active service are unable to follow their previous vocation, our experience should be of interest.

We find that these men after months of enforced idleness lying in a hospital are not in a physical condition to work the full regular factory hours, so we start them working four hours a day, giving them light jobs around the machines, chiefly hand-screw machines, drilling machines, etc., and instructing them how to grind tools or to do other light work. We have also made arrangements with the Toronto University for the men to attend the mechanical-drawing class two afternoons a week, which has a very beneficial effect on them, as it imparts the necessary knowledge of reading drawings and the use of decimals, at the same time giving them a change of surroundings. After two or three days around the machines, we put a man to perform some simple operation with another who has been on the job a longer time, until he becomes competent.

Those that show ability and initiative are put on the engine lathe, universal grinding or other machine, fitting them to take a position in the toolroom or production department as tool fitters on hand-screw machines, automatic screw machines and the like.

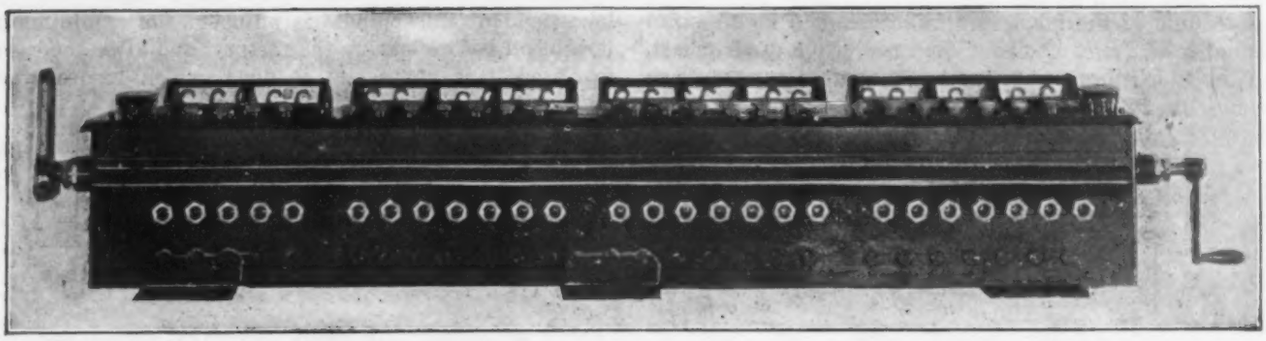
Returned soldiers make efficient machinists and are better qualified through the coöperation of the mechanical-drawing classes at the university than 60 per cent. of the so-called machinists.

We have also a system of awarding marks which shows the progress a man is making. A man can make 30 marks a day, but if he is late he loses five, which induces him to be punctual. When he can operate a machine satisfactorily he is given five marks; for grinding tools 10; for a certain quantity of good, accurate work five, and so on. A report sheet is made out in duplicate every two weeks, one of which is given to the man for his information and the other filed for reference. We find this a quick and satisfactory way of dealing with these men.

We take in various kinds of machine work and make 90 per cent. of our tools.

Production is a secondary consideration, quality and accuracy being considered before everything else; speed comes with practice.

We have passed quite a number of men through this department with no more than 10 per cent. actual failures; 50 per cent. made good as machinists, and the remainder made good operators and machine-tool fitters on repetition machines.



Manufacturing a Mechanical Lubricator—I

By M. E. HOAG

Builders of automobiles long ago adopted the force-feed mechanical lubricator, and the manufacture of this article for this purpose has become an important industry. Builders and users of machine tools now realize the value of this device, and many are equipping their machines with it to some extent.

THE shop from which the material for this article was obtained was selected because it has a large number of interesting machining operations, devices and methods in use that might be applied to the manufacture of devices of a similar nature, and will therefore be of interest to engineers, designers and shopmen. Competition has become so keen of late years that if a manufacturer wishes to stay in the trade and not sacrifice quality in his product he must use every means to keep his costs down. Some try to do this by using cheap help, which in most cases proves dearer in the long run; others try wage cutting, which is equally as bad, and either one is liable to land him on the rocks eventually. The wise manufacturer will aim to reduce the cost of manufacturing without injuring the quality of his finished product, and he will try to simplify his machining operations and reduce them to punch-press work or drilling-machine operations, or do them on machines designed especially to handle that particular operation or part. He will also design his tools and fixtures so as to eliminate unnecessary motions by the operators. Many parts of intricate shape which would involve complicated machining operations but which are not subjected to unusual wear or severe strains can be made by die casting and so eliminate all machining operations. These things have been kept in mind by the Madison-Kipp Co., Madison, Wis., in planning the work on its lubricators and it is getting results that will, I believe, be clearly shown in this article.

The company employs a considerable number of women and girls in all departments, paying them the same rates as men. In many cases they are making as much as $4.50 to $5 a day, and they are turning out just as good work and just as much of it as the men. Suitable well-lighted rest rooms are provided for the women employees. They are not required to wear uniforms, each one being allowed to dress according to her own taste. Mr. Baker, the factory superintendent, is a believer in the efficiency of women in the shop, provided they receive the proper attention and training at the start. Large, well-lighted rooms on the second floor of the office building are provided for the engineering department, while on the ground floor are the general offices and a well-equipped experimental laboratory. The shops cover the ground floors and the second floors of the two main buildings between which is located the stockroom. This arrangement permits easy and rapid movement of stock to all departments without long hauls. A large and well-equipped toolroom occupies part of the second floor, as does also the testing room, a section of which is shown in Fig. 1. Here

FIG. 1. UNIT-TESTING BENCH

each unit of the lubricator is adjusted to give a fixed number of drops of oil for each revolution of the shaft, after which they are tested to a gage pressure of from 2000 to 4000 lb. per square inch, any unit failing to stand this test being rejected.

This lubricator is made in two styles—the blind feed, which has but one barrel and one pressure plunger, and the sight feed, which has a double barrel and a measuring plunger as well as a pressure plunger. Both are made up of separate units, the size of the finished machine depending on the number of units used and the length of the tank. It is the construction of the sight-feed lubricator which will be dealt with principally as it involves more interesting machining operations and tools than the blind feed.

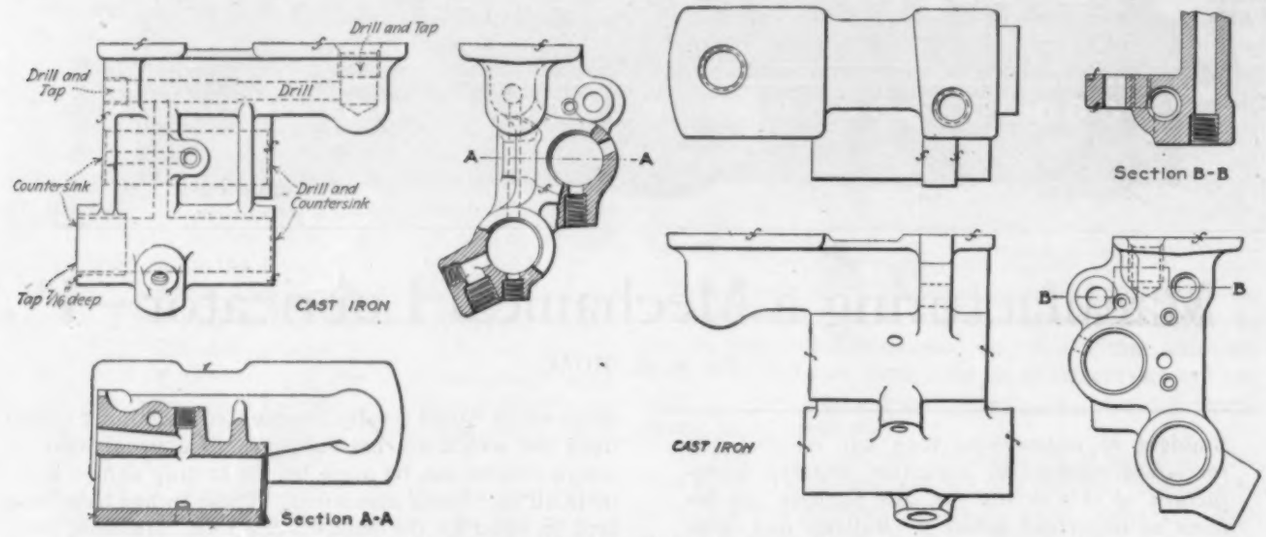
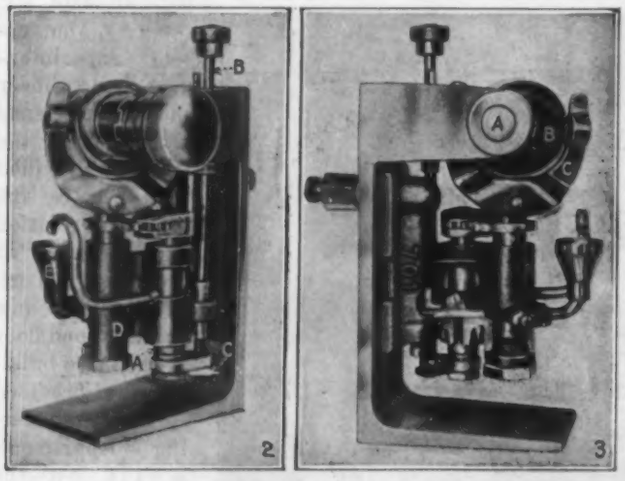


FIG. 6. DRAWINGS OF BARREL



FIGS. 2 AND 3. LUBRICATOR UNITS

Two views of a sight-feed unit are shown in Figs. 2 and 3. In the demonstrating sections from which these illustrations were made parts of the barrels have been cut away to show the construction and inside workings of the various parts. Fig. 2 shows the measuring plunger and adjustable sleeve *A*, which is adjusted by the spindle *B* to give any amount of oil within the capacity of the machine. The nut *C* on the lower end of this spindle is adjusted for a minimum flow of oil before leaving the factory, and after the case is closed it is not easily changed, which insures the user against its being tampered with and causing trouble. It can, however, be adjusted from the outside for an increased flow of oil when machines are running under heavy load or at higher speed than usual. The measuring plunger forces the oil through the curved copper pipe into the cup *E*, from which it passes to the pressure plunger in the barrel at *D*, which forces it to the parts of the machine to be lubricated.

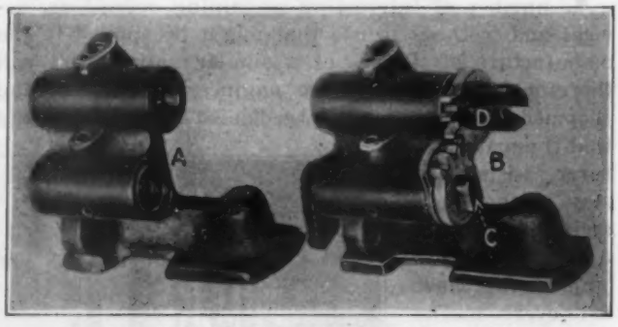


FIG. 4. LUBRICATOR BARREL AND PLUNGERS

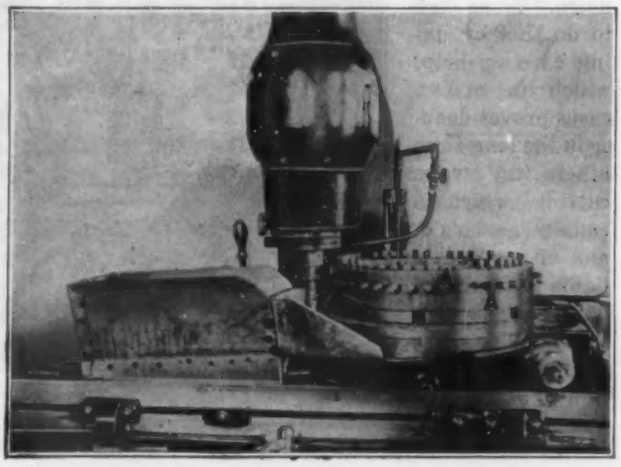


FIG. 5. CIRCULAR MILLING FIXTURE

The movement of these parts is obtained through the shaft *A*, Fig. 3, which operates the eccentric *B*. This eccentric carries a steel ring with two trunnions, which turn in bushed bearings in the yoke *C*, and owing to the peculiar shape of this eccentric it imparts an oscillating as well as an up-and-down motion to the plungers which are geared together. This oscillating motion serves to open and close the ports in the plungers and sleeve at the proper time and thus controls the flow of oil without the use of valves.

The reader will bear in mind the names and functions of the various parts mentioned and lettered in Figs. 2 and 3, as they will be described later in connection with machining operations. The barrel alone involves 40 operations to complete. Pictures of the barrel, both with and without the plungers assembled, are shown in Fig. 4. It will be noted from *A* that the ends of

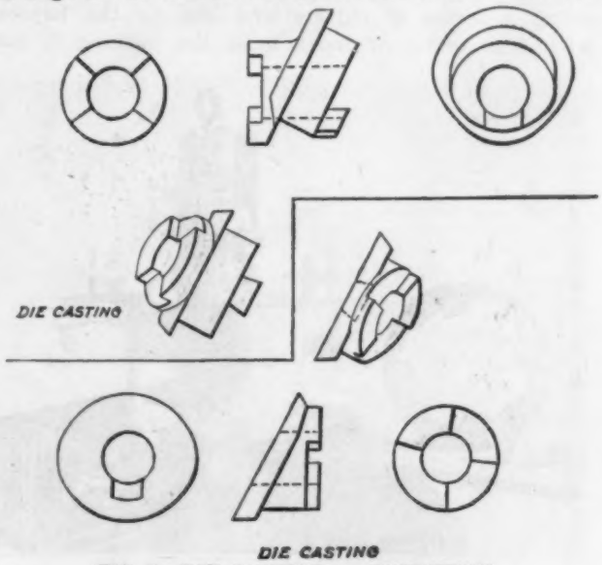


FIG. 7. DIE CASTING OF ECCENTRIC

the barrel are faced off to different lengths, and the method of doing this will be described later. At *B* is shown the barrel with plungers assembled and gear sectors in position. One of these gear sectors is a die casting, while the other is a steel punching pressed onto the plunger, which is turned with a slight shoulder at the location of the sector which is pressed and swaged to place in dies. The teeth of the steel gear are cut after the sector is swaged to place, being located from the openings in the plunger so that correct alignment of these openings with the gear teeth is secured.

The end of the measuring plunger *C* is straddle-milled and the pressure plunger *D* slotted in the circular milling attachment shown in Fig. 5. This fixture is simple in construction, being placed on the circular milling attachment of a Milwaukee vertical milling machine. The rings *A* have 45 openings to receive the plungers, which are held in place during the milling operation by the setscrews seen at the top. Production rate with this fixture is about 2300 pieces a day.

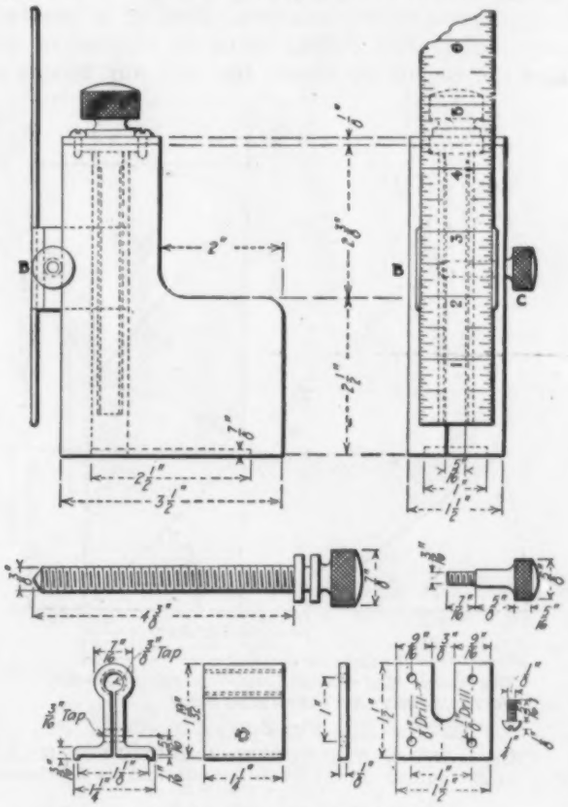
Drawings of the barrel showing the surfaces to be machined and the numerous openings to be drilled, tapped and reamed are shown in Fig. 6, and will give the reader an idea of the operations to be done in order to complete this piece. A few of the most important of these will be described in detail.

The eccentric, which is shown assembled in Figs. 2 and 3, is made up of two die castings so constructed that they interlock and are held together by the driving shaft when the latter is passed through them. This makes it possible to use a continuous eccentric ring which is very desirable. Drawings of these parts are shown in Fig. 7. No machining operations are required on the die castings.

Adjustable Scale Holder

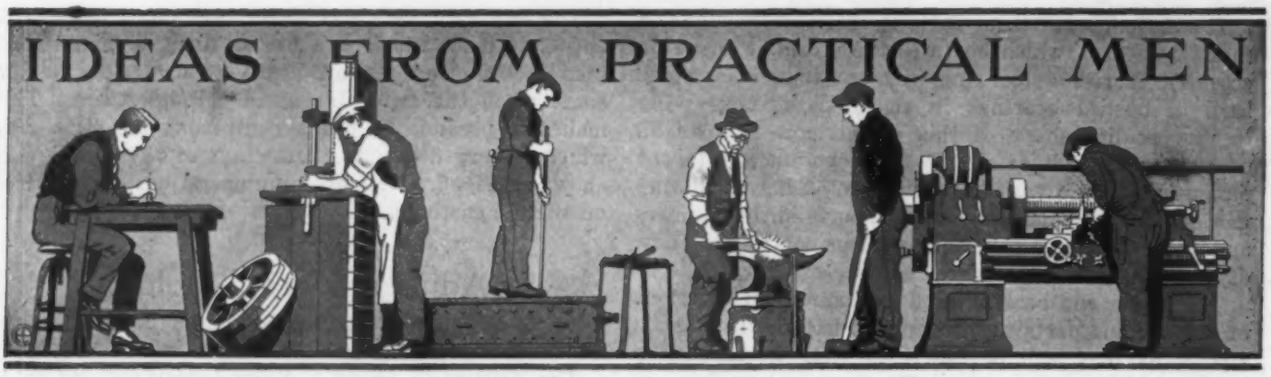
BY JAMES WYLIE
Glasgow, Scotland

The illustration shows a device I designed and made for holding a 12-in. scale when marking out work on the surface plate. Sometimes in such cases when scribing the center line and trying we find its height (say $4\frac{1}{32}$ in.) from the surface plate is above or below an



ADJUSTABLE SCALE HOLDER

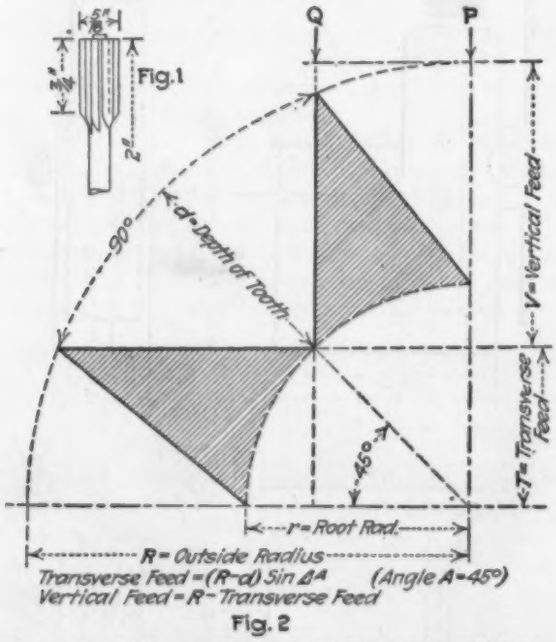
inch mark on the scale. This is very often a pitfall, many errors being made, especially when adopting the entirely unsatisfactory method of holding the scale up against the work or using the marking plate at the end of the surface plate. The illustration shows the base with the adjusting screw and the clamp *B* holding the scale in position. The knurl-headed screw *C* binds the scale into the clamp. To use it, it is only necessary to strike the center line of the work with the surface gage and apply it to the scale. If the scriber is above or below the inch mark on the scale adjust the screw *A* until the scriber is opposite an inch mark on the scale, this making all measurements above or below the center line simply. The base is heavy enough to hold a 2-ft. scale. I have used this device in the toolroom for three years and find it very useful.



Cutter Formula for Special Fluting

By R. E. Vivian

A cutter blank, Fig. 1, was handed to me to flute on a universal milling machine. Finding it impossible to use an angular cutter, owing to its fouling with either the dog or the chuck, the only way was to use



FIGS. 1 AND 2. THE CUTTER AND THE FORMULA
Fig. 1—The cutter. Fig. 2—The formula and its development

an end mill and derive some formula to obtain the required transverse and vertical feeds to produce the required tooth.

Upon drawing the job to larger scale the necessary formula clearly showed itself as will be seen in Fig. 2.

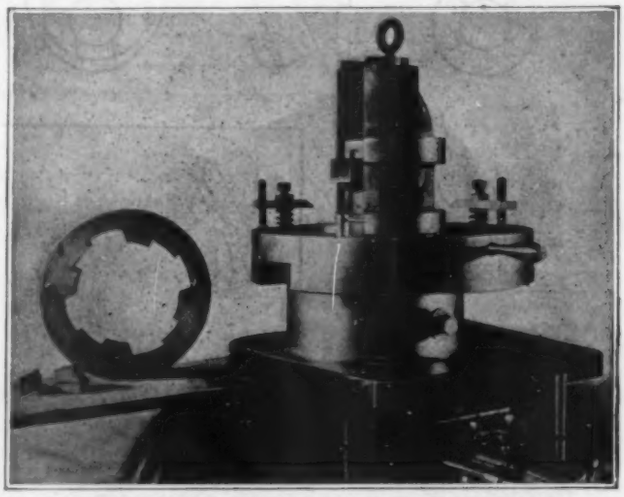
Method of operating: Point *P*, being set perfectly central, set end of mill to it and the cutting edge in contact with the work. Feed transversely to the required depth as per formula.

Slotting Breech Bushings

By H. W. Merrill

On page 697, is a description of some work done on a howitzer breech bushing. The illustration shows a Mitts & Merrill No. 5 Giant keyseating machine fitted for doing this work, which is in use in the plant of the Four Lakes Ordnance Co., Madison, Wis.

The bushing is fastened to an index plate on the work table. Special cutters that are both shaped right and make the proper height are employed, so that in using a series of cutters and spacing the keyseats with four series of index holes the bushing is completed without fuss or measuring. The cutters are simply inserted in the tool bar and fed up against a stop, each doing its work to the proper depth.



KEYSEATING MACHINE FOR SLOTTING BREECH BUSHINGS

Welding High-Speed-Steel Forming Tools of the Dovetail Type

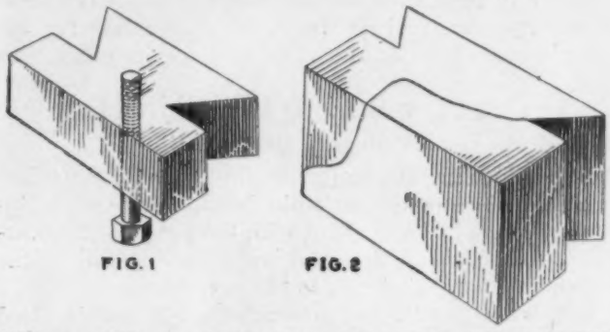
By Harold V. Styers

Some months ago I was asked by the superintendent to try to determine the cause of some of the tool failures, especially in high-speed-steel forming tools, which were expensive in first cost and still more expensive when machined, hardened and ground ready for use.

To this end I worked for several days on the automatics and finally reached the following conclusions. First, inexperienced operators do not know the proper position to set the tool in relation to the centerline of the work. Second, they will get too much tension on the holder, which acts as a double wedge on the dovetail and causes the latter to break. Third, they do not keep close enough watch of the end of stock. The first trouble can be overcome by instructing the operator; the second by giving him a shorter wrench and by blocking up under the tool with a jack of the same shape as the dovetail but slightly smaller so that the

holder will not squeeze it (see Fig. 1), and the third by not being too eager to use up all the material to the disadvantage of the forming tool. It would be cheaper to throw away 6 or 8 in. of stock than to break the forming tool which at a conservative estimate costs approximately $50.

The following are some of the ways I have reclaimed a tool the market value of which was the current scrap price of high-speed steel: Having had considerable experience with the various means of welding I decided to try the electric arc, as I wanted to preserve the



FIGS. 1. AND 2. JACK FOR BLOCKING UP FORMING TOOLS AND A BROKEN TOOL REPAIRED BY WELDING

temper that was already in the tool and alter its shape. The first tool I attempted was one with half of the dovetail broken off. This I set in a vise fastened to the welding vise and used the regular welding iron, building the metal up above the existing dovetail. The tool was then taken to the toolroom and the dovetail refinished on the shaping machine. This tool has since machined 2000 parts and is still ready for service at any time.

My next tool was one with the whole dovetail broken off. As we had no other tool in stock at that time I took the only chance and the tool is running as good as ever. I have since reclaimed several under similar conditions.

I have tried holding the tools in water while welding, but this will cause them to crack all to pieces. And I do not find that the temper is in the least hurt by the heat generated in welding. A not unusual break happened a short time ago. A forming tool broke through the face at a right-angle back about ½ in. deep and then over into the base of the dovetail, which was pulled off as shown in Fig. 2.

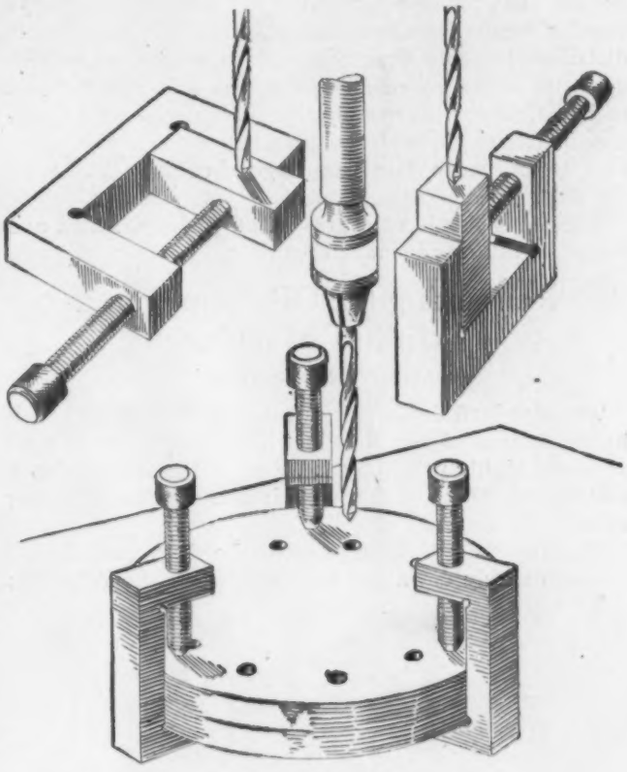
I ground this tool back from the break leaving a V-shaped opening about ½ in. deep, and secured it in the vise diagonally to force the broken edges together good and snug, welding it in this position. After it had cooled I ground off the excess metal and had the cutting edge sharpened. It is producing as good work as it did when new. It produced 500 pieces before it was taken out for grinding, which is evidence that the temper was not harmed. This tool will probably not have the life of the tools that only had a broken dovetail, but if it continues its work it will soon pay for its repair. It is working on hexagon stock, which furnishes additional evidence of the permanency of the repair. In welding these tools I find better results are obtained by keeping right on welding until the job is completed regardless of the heat, as the liability of slag is not so great.

Toolmakers' Clamp

By J. A. Lucas

A quickly and cheaply made clamp for toolmakers' use is made from flat cold-rolled or cold-drawn steel bar. The sketch plainly shows the manner in which it is made.

To be durable and accurate the pieces should be



A CHEAP CLAMP

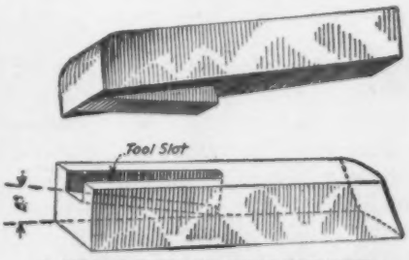
carburized and hardened, after which they may be ground all over. The screws may be quickly made on the screw machine. The ends of the screws should be hardened.

A New Type of Toolholder

By John Miles

Victoria, Australia

A toolholder that has proved satisfactory under working conditions on ordinary lathes up to 18-in. swing is shown in the sketch. The body is made of a piece of 1 x ⅝-in. mild steel with a slot ⅜ in. square cut in the center as shown, the angle being about 8 deg. This slot can be cut with an end mill or a hole may be drilled at the end of the slot and the stock removed in the shaping machine. The top plate is a piece of tool steel ⅝-in. square with a portion of its under surface milled away to leave a projecting tongue of the proper angle and depth to



A NEW TYPE OF TOOLHOLDER

enter the slot in the body of the holder and bear upon the tool bit, which is the usual piece of ⅜-in. square high-speed steel.

The knurling was done with a set, but it was found by experiment that the tool would hold against the pressure of the cut without it.

One of the advantages of this form of tool is that the bit is held by pressure of the toolpost screw, and consequently there is but one screw to loosen when it is to be taken out for grinding. Another advantage over the regular form with the setscrew is that the pressure is distributed evenly over the surface of the bit, which does not break so readily as in the setscrewed form, and further the absence of the bulge necessary to provide material to hold the setscrew enables the operator to get much closer to large shoulders than with the older form.

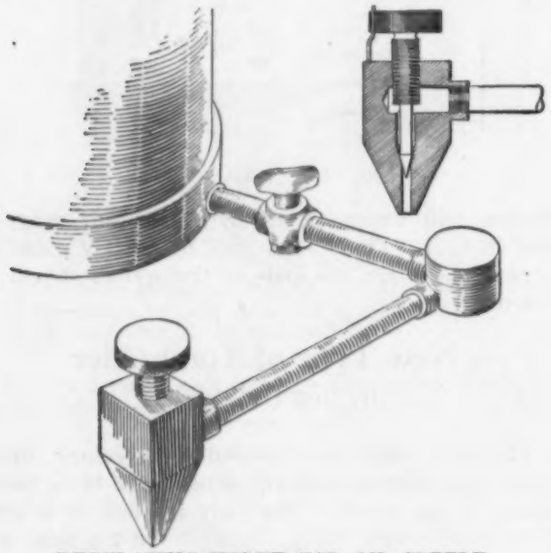
The parts should of course be properly hardened and tempered in order to make them last.

Regulating the Oil Supply on a Milling Machine

By Ivan H. Spoor

The standard device for regulating the supply of oil to the cutters of a milling machine, while nice to look at in its highly polished condition, is far from being a satisfactory thing, and much time is wasted in trying to regulate the flow of oil.

The trouble is largely due to the fact that the oil flows so slowly down the long pipe after the valve has



REGULATING VALVE FOR OIL SUPPLY

been opened that it takes seconds, perhaps minutes, for a change in the position of the stop cock to effect a change in the number of drops per minute flowing down onto the cutter. When the valve has been regulated and the machine stopped it is a case of letting the oil run or of starting the regulating business all over when the machine is started again.

Lard oil is at best rather dirty stuff, which soon makes a black coating over the slides and surface of the machine, and besides it is quite expensive.

To remedy this poor regulation the spout was sawed off so as to make a square end and a piece of brass was drilled and tapped as shown on the cut and soldered onto the end of the spout. A cone-pointed regulating screw with a knurled head was provided, and a piece of spring wire to act as a detent to keep the screw in place when a chattering cut is in progress completed the device. The needle valve need not be absolutely tight, as the cock near the tank stops the oil from flowing.

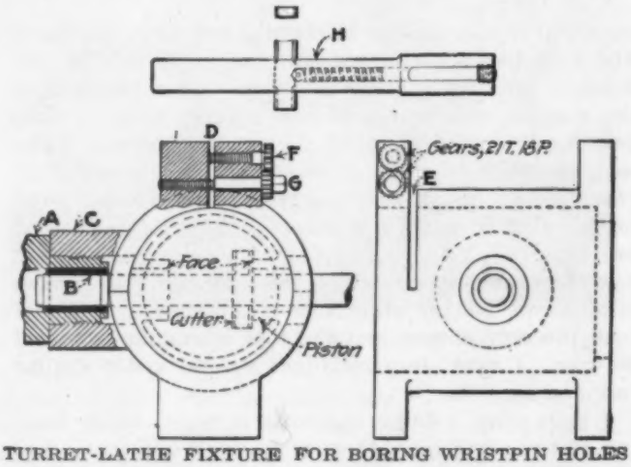
The advantage of this device is that the flow can be regulated very easily and it stays regulated. When the machine is stopped the stop cock is closed and the adjustment preserved while the flow of oil is stopped instantly, a condition which did not exist with the single cock. Any regulation of the flow of the oil is immediately apparent and no long wait is necessary for the change of position of the valve to show its effect.

Fixture for Boring Wristpin Hole

By Robert Belmont

In making gasoline motors of the larger type we had trouble in boring the wristpin holes, which would invariably be out of alignment with the pistons. To overcome this trouble I designed the fixture shown in the sketch to adapt this work to the turret lathe.

The lathe spindle is represented at *A* and is fitted with a pilot bushing *B* to guide the boring bar. *C* is



TURRET-LATHE FIXTURE FOR BORING WRISTPIN HOLES

the fixture, which is of cast iron bored to receive the piston and fitted to the spindle nose of the machine in such a manner as to bring the center line of the bore at right angles with the center line of the spindle of the machine.

The casting is split part way through at *D* and *E* and is provided with screws *F* and *G* with which to clamp and hold the pistons in place during the boring operation. These screws are provided with a collar head on which are cut pinion teeth, the diameter of the collars and spacing of the screws being such as to make the small gears mesh properly.

Two or three teeth were cut out of one of the pinions to permit the screws to be assembled, their relative positions being such that a half turn will open the clamping ring by releasing one screw and tightening the other.

The boring bar and facing cutter is shown at *H*, the cutter being made to cut in either direction so that both pin bosses may be faced at one setting. The cutter is held by a ball and spring and can be inserted or removed readily without the use of a wrench.

EDITORIALS

Providing Employment on National Improvements

THE transition from peace to war caused an excessive demand for labor with the resulting competitive bidding among employers and the soaring of wages to unheard-of heights. The natural expectation is that this condition will be reversed now that we have returned to peaceful pursuits. But there are complications which may be not only troublesome but serious—some fear disastrous.

* * *

The first thing to be reckoned with is the matter of employment; the second is the cost of living. For we must not forget that, roughly speaking, old H. C. L. has tagged close on the heels of the inflated wage scale, so that unless we deflate the prices of commodities the wage scale cannot be materially reduced.

But the real problem is that of employment—of so managing industry that the worker released from strictly war tasks can be steadily absorbed into peaceful occupations. Without employment it matters little whether milk is 8 or 18c. a quart—the present price uses up the savings at a faster rate, and when they are gone it makes no difference what the price is. Unemployment is to be avoided at all hazards; nothing can be more serious at this time. Unemployment means unrest, and unrest is dangerous in the extreme.

How can it be prevented? How can we keep our people employed during the transition period? Every thoughtful employer is considering this question seriously.

* * *

Some are planning to make needed changes in their plants; to remedy the wear and tear and put their machines in good condition; to restore to a reasonable degree at least their depleted supply of small tools and similar equipment. They know that this may cost a little more now probably than a year later, but they also know that it pays to have their equipment in good condition. Then too they realize that anything they can do to stabilize conditions is just as much a patriotic duty as buying Liberty bonds or engaging in other wartime efforts.

* * *

There is, however, a possibility that there may not be a sufficient number who will do this, or that it may not absorb enough of the surplus labor. Some advocate the continuation of some of the war contracts simply to keep labor employed. Such a course is open to many objections, the principal one being that it is a complete economic loss to make articles that will serve no immediate useful purpose. The same amount of energy and material can be well utilized in things that can be turned into national assets, the three coming first to mind being highways, railways and water powers. The first two are greatly in need of improvement, and water powers urgently require development in many sections of the country. All three are great national assets, no matter what form of control we eventually adopt for them. All of them would give employment to a great variety of labor and act as a reservoir or compensating basis for industrial demands for labor.

There will be many lines of activity develop as soon as we are sure that war activities can cease, but we must have no more gap than necessary. We must realize the change in short order and get started in the new work or the old as the case may be. We must not wait to see what the other fellow is going to do, but must keep things moving.

* * *

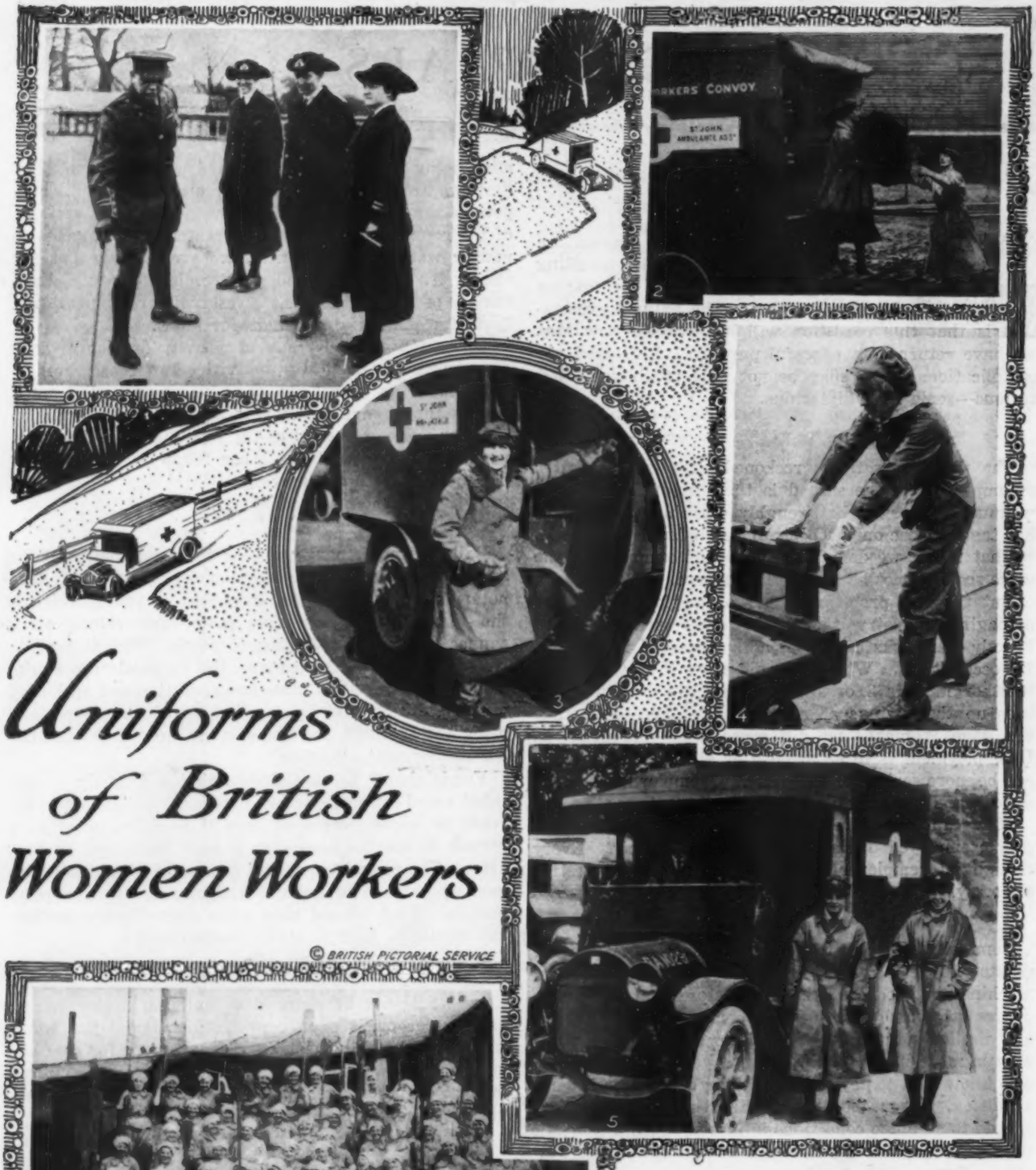
Railways need many machine tools, locomotives, cars and other equipment. The shop equipment has been notoriously inadequate for a number of years, which is the reason that the motive power and rolling stock cannot be kept in condition to render efficient service. No matter who is to manage the railroads the equipment should be put in first-class condition and authority given them to order this equipment at once, especially when these orders are immediately needed to stabilize the employment situation.

Funds should be available so that a properly constituted board can place orders for work on highways, railroads or water-powers at once if need be, or at such periods as may be necessary to meet conditions as they arise. The committee should consist of big, broad-gage men who should be unhampered by red tape and petty politics. They should have wide discretionary powers, but should be held to strict accountability.

Such activities would affect a large variety of industries and give employment to many kinds of labor. They would not be confined to building highways, repairing locomotives or constructing dams, but would include road-making machinery, machinery for cars and locomotives, waterwheels, electric generators, electric motors, transformers, wire, etc. And back of all, the various kinds of machine tools.

* * *

We trust the emergency which would require such a program may never arise. It may be better if these improvements to our country's resources come in some other way. But it can do no harm to prepare for the emergency, to have the men and the money available should they be needed, and it may save us from many serious regrets should the necessity arise and find us unprepared. Unemployment is sure to bring unrest. And the peoples of the world have been too wrought up by the great upheavals in Europe to view threatened hunger and cold with equanimity. It is better to be safe than sorry.



Uniforms of British Women Workers

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1, Womens' Royal Naval Uniforms

2, First-Aid Drivers Loading Cars

3, Typical First-Aid Driver

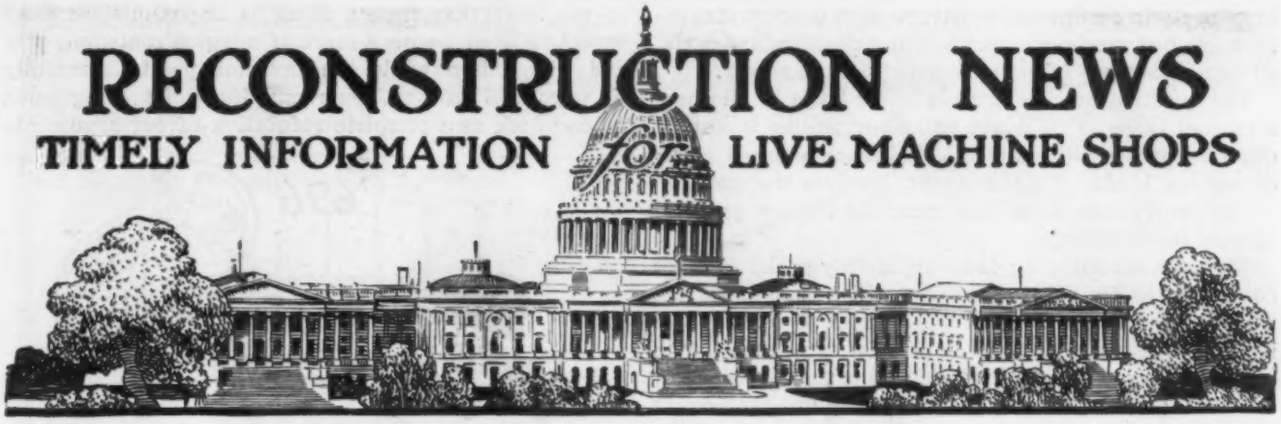
4, A Shell Factory Worker

5, Voluntary Aid Ambulance Drivers

6, A Group of Bakers

RECONSTRUCTION NEWS

TIMELY INFORMATION for LIVE MACHINE SHOPS



ONE of the things to be borne in mind as we proceed in developing our program of readjustment is the prevention of all forms of unnecessary waste. The old adage, "A penny saved is a penny earned," was never more true than now. This does not mean that we should get along with an old machine when it would be more economical to purchase a new one, but that the unnecessary waste of material, of work done or of the men and women whose labor enters into the production of everything should not be tolerated in any manner.

Conservation of the natural resources, of labor and of raw material is the most important problem before us. It brings to our attention more forcefully than ever the close connection between the welfare of every individual in the country and the welfare of the country itself, and shows that the wealth of the nation depends primarily upon the health and well-being of its hundred and odd million inhabitants. It shows very clearly that anything that preserves the health of the individual worker is an asset to the country, and it proves that those who have been asking for a health-insurance act for the last few years were more farsighted than they were given credit for. Just as accident-compensation laws have reduced the number of accidents so, it is pointed out, will health-insurance laws reduce sickness by promoting a financial incentive for eliminating conditions that are detrimental to health. And this will reduce waste of our greatest assets.

Men from the Army

The United States Employment Service is asking employers in need of technical and other highly trained men to coöperate with it by taking those so qualified from the ranks of the commissioned and enlisted who are now leaving the various camps. Hundreds of officers, many of them of the higher ranks, are asking the camp representatives and the federal directors of the United States Employment Service for assistance in obtaining new employment, as many of them, though thoroughly qualified in every particular, are leaving the army without having a position in sight.

The reconstruction program of the United States Employment Service links up all national and local efforts, both governmental and private, and centralizes in every community, through the local bureaus, all information pertaining to the proper openings in industry, commerce and agriculture available to the nation's fighters and war workers. It also calls for assisting them to obtain the best work the country can give, the qualifications of the different individuals being of course duly considered.

As most soldiers expect to return to their home communities the task of aiding them in finding work is primarily a community responsibility, for which the local bureaus are the best agencies. A recent action of the Labor Department brings to the aid of the Employment Service 184,000 local units, among them 4000 community councils and 16,000 women's organizations, all centralized in Washington under the guidance of Nathan A. Smyth, Assistant Director General of the United States Employment Service.

This is probably one of the most important features of reconstruction or readjustment at the present time, for, coming as it does at the beginning of winter, when out-of-door occupations are necessarily restricted, it makes the question all the more difficult of solution and imposes greater responsibility on those engaged in the management of industry. The closest coöperation is necessary in every community in order that those who were drawn from the nation's industry may have no reason to feel that "republics are ungrateful."

Conserving Energy and Materials

One of the ways of conserving energy and materials is to continue as far as practicable the elimination of unnecessary sizes and styles of various products. In Great Britain considerable attention is being given to this, the British Engineering Standards Association devoting much of its time to the subject. One result of this has been that the steel mills have greatly reduced the number of their roll patterns, nearly 96 per cent. of all the steel made now being done on standard rolls. In tramway rails the number of sections has been reduced to 5 where formerly there were over 70, and even these are being reduced to three patterns.

There is always a limit, however, as to how far standardization and interchangeability can go without crippling initiative and the desire for better things. If we confine standardizing to the product and not to the means of producing it we shall be in less danger of doing damage. We must not, however, attempt to standardize the completed product, in many cases, but rather such parts as may be used in different ways.

The automobile field furnishes many examples of how standardization may be serviceable without limiting improvements in design, and in other ways. The Society of Automobile Engineers has standardized bolts, washers, wheels and similar parts, but left sufficient leeway

for variety in design and construction to prevent stagnation. No designer can object to using the standard parts, effecting economy in both construction and repair.

The question of export trade looms large in all quarters, and there is no doubt as to our ability to supply other countries with materials and manufactured goods of various kinds. This, however, involves the question of shipping, and here the merchant-marine problem presses for solution.

The present shipping laws apparently make it more costly for the United States to run ships than any other country, and there is a great clamor to so revise these laws as will permit us to compete on even terms with other nations. But let us look at the matter squarely and see what this means before we decide what ought to be done. Changing the shipping laws to reduce the cost of operation to the level of the lowest carrier means that the wages of sailors will have to be reduced to the level of the coolie who now mans many of the ships. It means the driving of American-born seamen to other occupations because they will not and ought not to work for such wages or under such conditions; it means that while our flag might fly from thousands of ships not one of them would be manned by Americans

Do we want to pay such a price? Do we want to so change any law that it will reduce the standard of living in any trade to such a level?

If we want an American merchant marine, in fact as well as in name, we must pay the price in some way. We will pay in higher freight rates or in taxes if the ships be run at a loss, whether by the Government or with a subsidy. But it must be paid unless we can reduce the cost by mechanical means and by good management, as has been done in many cases with manufactured articles.

It is a serious subject and one which deserves careful thought from all sides.

How Did He Make This Casting?

By J. W. Wunsch
Paramount Pattern Works

The article by D. Little Cole, on page 696, under the title "How Did He Make This Casting?" caused a deal of merriment among our boys who, by the way, have been recently honored by the publication in your journal of an account of their efforts in the production of good patterns. The apparently unanswerable query, "Why do we make elaborate patterns when a yardstick will answer every purpose?" provoked their curiosity.

For the benefit of Mr. Cole I would like to say that should he press Pat for information he would discover that the "cart wheel" was not used at all, but that Pat probably used the trowel and yardstick in producing his mold very much after the manner of the Asbury Park sand sculptor.

As a side issue Mr. Cole's article is going to cause more or less trouble and aggravation to the already overburdened patternmaker for some time to come, as we may now expect large flocks of inventors who will ask us to make a simple rough pattern for a new and complicated form of carburetor or similar apparatus, which pattern must be available to cast in four or five sizes and several styles and not cost over five dollars.

After we have painstakingly explained to the would-be customer that such a thing is impossible we shall expect to be met with a stare of mingled contempt, pity and indignation while the inventor points scornfully to page 696 of the *American Machinist* lying open on our desk as a complete refutation of our arguments

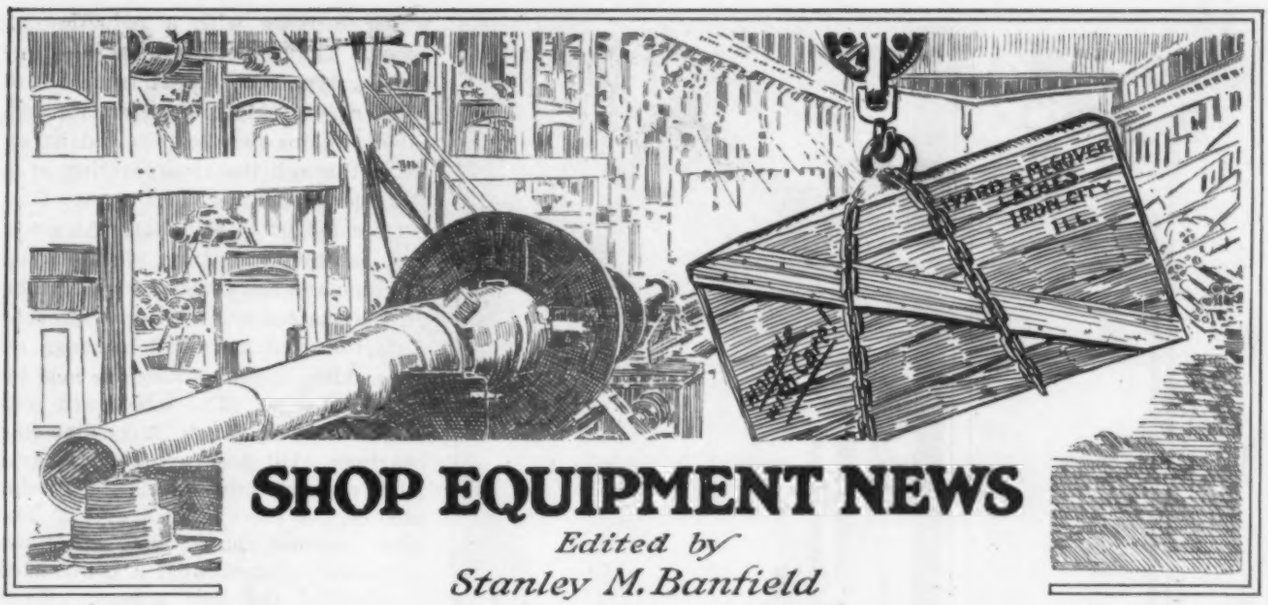
and a citation of the superior ability of our worthy competitor, Mr. Pat Moriarty.

Now, Mr. Editor, we are great admirers of your journal, and we would not for worlds insinuate that anything you saw fit to print might not be so, but won't you please relieve our troubled minds by telling us what to say to the demands and importunities of the recalcitrant inventor who really believes we should tell him how to mold his castings with a two-foot rule?—[The obvious solution would be to refer him to Pat.—Editor.]

Bed for German Long-Range Gun

The illustration shows the bed for the great long-range gun with which the Germans bombarded Paris, but which is no longer doing business at the old stand. American engineers are here shown examining the struc-

ture. The platform is approximately 35 ft. in diameter, 11 ft. deep, and weighs about 1100 tons. There were railroad tracks leading from the table, or platform, and connecting with two other tracks. It was over one of these tracks that the gun itself was hastily run as the Germans hurried back to escape the American advance.



SHOP EQUIPMENT NEWS

Edited by
Stanley M. Banfield

In conformity with a Post Office ruling, descriptions of new equipment can only be used in this department which have not been previously or simultaneously advertised in this or any other periodical.

Noble & Westbrook Automatic Graduating Machine

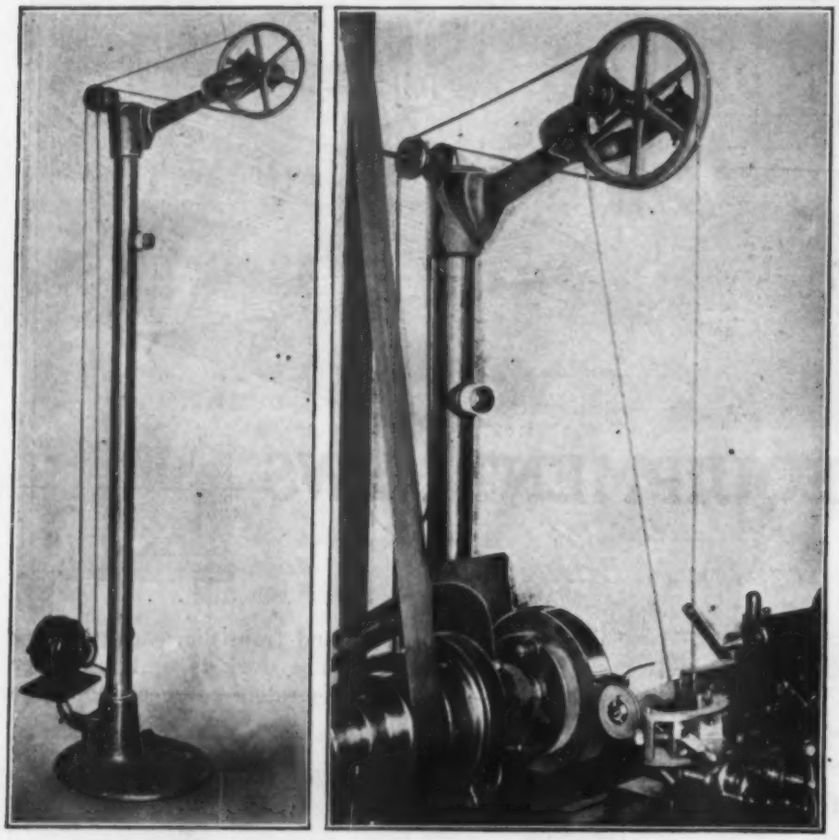
The graduating machine shown in the illustration is one of the recent products of the Noble & Westbrook Manufacturing Co., Hartford, Conn., and is intended for graduating work where speed and accuracy are required. The machine is power driven and automatic, the handling of pieces to and from the machine being the only labor required. The work is held in proper relation to the die with accurately cut gears, and the depth of the impression is controlled by a foot lever, a cam and a weight. An adjustable stop is provided for regulating the depth of graduation. The machine is made with steel spindles and adjustable bearings and is controlled by a clutch on the spindle of the driving die. Fig. 1 shows the machine itself, and Fig. 2 some of the work that can be accomplished with it. Work with various diameters is accommodated by means of an intermediate gear located upon the adjustable sector.

FIG. 1. NOBLE & WESTBROOK AUTOMATIC POWER-DRIVEN GRADUATING MACHINE

FIG. 2. SAMPLES OF WORK GRADUATED

Presto Portable Countershaft with Motor Drive

The illustration shows a new portable countershaft built by the Presto Machine Works, 124 Pearl St., Brooklyn, N. Y. The machine has been developed in connection with the company's work of making gages and has had an extended tryout under actual working conditions in the shop. The base is a heavy iron casting provided with a bracket to carry a ¼- or ½-hp. motor. This is plugged directly into the lighting circuit, the switch being conveniently located high up on the column,

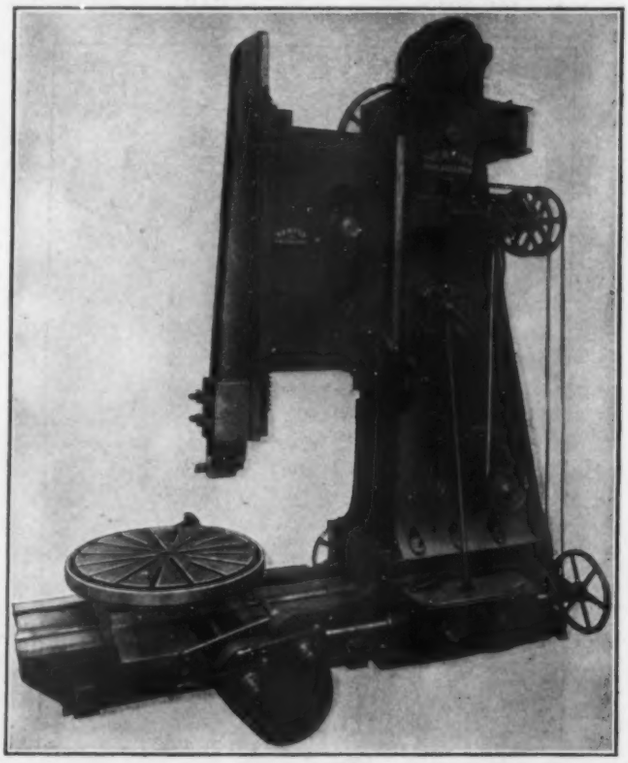


FIGS. 1 AND 2. PRESTO PORTABLE COUNTERSHAFT

which is of heavy iron pipe, and at the top is a bracket with idlers and driving pulley as shown. The outfit complete weighs approximately 75 lb., and can readily be moved from machine to machine where required. It is sufficiently heavy to stand where put without lag-screwing to the floor. Fig. 1 shows the complete machine, while Fig. 2 shows it in use with a toolpost grinding attachment on a 14-in. lathe while grinding the threads of an 8-in. plug gage.

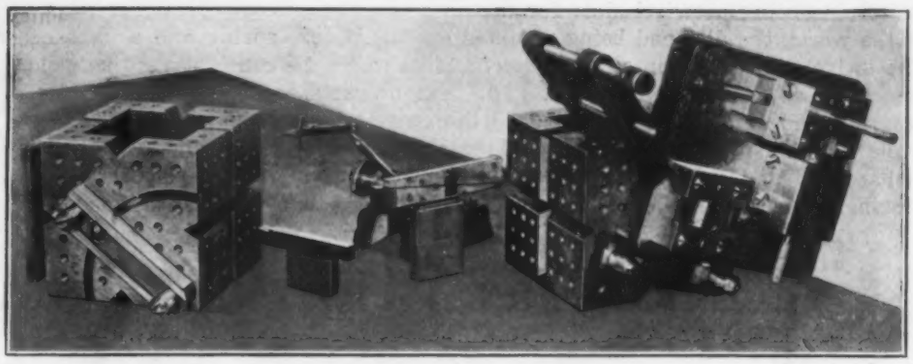
Newton Upright Generating Planing Machines

The Newton Machine Works, Inc., 23d and Vine Sts., Philadelphia, Penn., has recently placed on the market a line of heavy-duty upright generating planing machines, one of which is shown in the illustration. The machines are built in sizes of 36- to 72-in. stroke. It is believed that these machines represent an entirely new development and excel previous equipment offered for the same purposes in rigidity, convenience of control, permanency of alignment and capacity for rapidly removing excess metal from forgings or other similar parts. The rams, or cutter bars, are counterweighted and have square bearings in guides provided with taper adjusting shoes. The vertical clamping surfaces are solid and steel faced and are equipped with suitable toolholding clamps. Beneath the rams are mounted the steel swiveling relief toolbox aprons, which can operate in any position in a complete circle. Motion is transmitted from the driving motors to broad-faced steel racks on the back of the cutter bars through all-steel spur reduction bears, the pitch and width of face of which increase with a reduction of speed. The motors are of the reversing type with speeds from 400 to 1200 r.p.m. Rapid traverse for the table motions can be provided as an extra through the incorporation of a suitable mechanism and the use of an extra constant speed motor. All gears are on the operating side of the machine and are wholly inclosed. The circular tables are ribbed to prevent distortion and have full bearings on the saddles, to which they are held by corner clamps. The tables are centered by deep-faced, large-diameter bearings. Oil pans are cast integral with circular tables and are graduated on the exterior in degrees. The table saddles have narrow guide-alignment control with a centralized location of the feed screws. Hand adjustment of the saddles is provided at both ends of the cross-slides. All feed motions are independently clutched. The cross-slides are of heavy box section with square bearings and are provided with taper shoes for side adjustment. The feed screws have bearings at each end to insure operation in tension. A new sensitive stroke-control disk has been incorporated, the trips on which can be operated by hand while the machine is in motion, this feature being desirable in compensating for the drift of the motor. The feed mo-



NEWTON UPRIGHT GENERATING PLANING MACHINE FOR 72-IN. STROKE

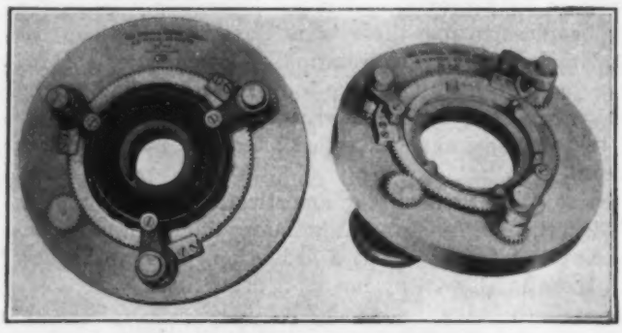
tion is taken from a rocking friction box, on the outside of which the pawl-rod stroke-adjusting screw is located. The circular, cross and longitudinal feeds are variable in rate and are reversed by the use of a ratchet and pawl. The cutter-bar guide on the 36-in. machine is cast solid with the frame, while those on the 56- to 72-in. machines inclusive are separate from the frame and have vertical hand-control adjustment to permit their location in the correct relative position to the cutter bars. The cutter-bar-guide adjusting mechanism is of tandem design to prevent the dropping of the guide in case of accidental breaking of the counterweight ropes.



PRESTO SINE BAR AND ATTACHMENT

Garrison "O. G." Bevel-Gear Chuck

The Garrison Machine Works, Dayton, Ohio, has recently placed on the market the "O. G." bevel-gear chuck. This is designed for the rapid chucking of bevel gears true with the pitch diameter and for the grinding or re-machining of holes or other integral parts. It is said that the actual chucking time for a gear 6 in. in diameter is 5 sec. No measuring, truing up, indicating or experience is required, the gear simply being placed in the chuck and the knob at the back turned, this clamping the gear automatically in position. This knob turns all the clamps simultaneously into radial position over the gear



GARRISON "O.G." BEVEL-GEAR CHUCK

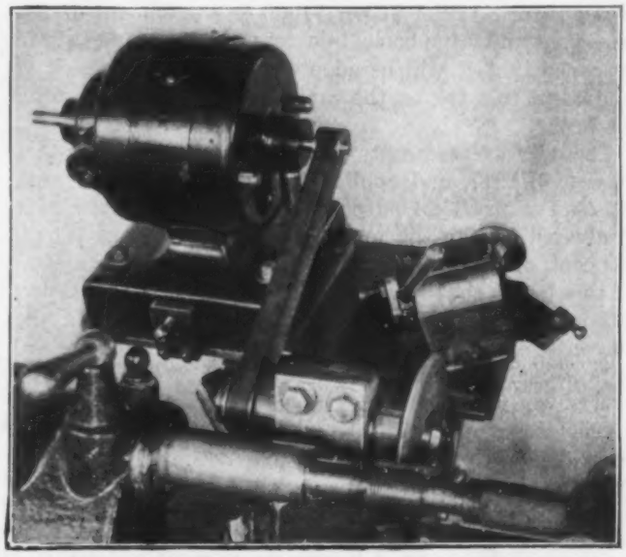
and then clamps them. This motion is accomplished by cams located on the lower side of the clamps and on the upper side of the pinions shown beneath the clamps, and is completed by approximately one-half of a revolution of the knob at the back of the chuck. Unequal pressure on the clamps is avoided, as they are brought down on the gear with a light coil spring, which is located inside of the hollow stud on which the clamp is mounted. The rear, or outside, end of the clamp is brought down over a stud by a spring inside of the stud until the point or inner end contacts with the gear. The device can be furnished for spur, helical or skew bevel gears and pinions.

Presto Sine Bar and Attachment

The illustration shows a sine bar attachment developed by the Presto Machine Works, 124 Pearl St., Brooklyn, N. Y. The sine bar is 4 in. long and the attachment is an accurately finished 4-in. cube. All faces of the cube are provided with a number of tapped and countersunk holes for attaching work, clamps, etc. Five sides of the cube have accurate V-grooves for seating cylindrical work, and one side has a T-slot quadrant for attaching the sine bar, as shown in the illustration. With this attachment the sine bar can be set to either the sine or the cosine of the angle, whichever is most convenient, and then by using the proper side of the fixture as a base the desired sine or cosine is placed in working position.

American Standard Portable Thread-Grinding Attachment

The American Standard Gauge Corporation, 7-8 Chatham Sq., New York City, has recently placed on the market the new portable thread-grinding attachment shown in the illustration, which is intended to be attached to any lathe by clamping to the compound rest. When out of use it can be removed from the lathe and stored away, not requiring any more space than the center grinders in common use. It is intended for use on gages, taps and cylindrical work, but can also be used as a center grinder, for face grinding, chucking work, etc., as since being mounted on the compound rest of the lathe it can be swung to any position. For thread grinding there are two dovetail



AMERICAN STANDARD PORTABLE THREAD-GRINDING ATTACHMENT

slides, one being a swivel slide for dressing the angle of the wheel, the diamond being mounted on this slide. The swivel slide is mounted on a second slide to meet the wheel as it is being dressed. This has brackets, or stops, and adjusting screws to hold the swivel slide while the dressing is in progress. The wheel spindle is hardened and ground and runs in phosphor-bronze bearings which have oil chambers and are adjustable to compensate for wear. Side play is taken up with a flat spring and a hardened-steel ball, thus eliminating the constant readjustment of nuts, etc., the device taking out all side play. Pulleys are used for the drive, these being of a size to fit the operation in hand. The motor is provided with a rheostat in order that various speeds may be obtained, and may be adjusted in regard to its distance from the grinding-wheel shaft.

Federal Taxes and the Manufacturer*

By GEORGE R. WEBSTER
Price, Waterhouse & Co.

THERE are at present several federal taxes—undistributed profits tax, capital-stock tax and the income and war-excess profits taxes. The first two are relatively unimportant and can probably be dismissed with little consideration.

So far as my experience has gone, the only benefit that can possibly have come to the Government from the undistributed-profits tax is that it probably induced some corporations to make purchases of Third Liberty bonds to a greater extent that they might otherwise have done. From the returns which I have seen or prepared I think that the Government is going to derive practically no revenue from this tax. Under the proposed bill the tax is dropped. From the experience of this tax for the one year in which it has been in force I think that everyone must be heartily disgusted with the results and that we can safely hope that this tax will disappear in the future.

The capital-stock tax was first imposed for the half year to June 30, 1917, and is under the existing law at the rate of 50 cents per $1000 on the fair value of the capital stock in excess of $99,000. The return has varied each year, and the return which had to be filed on Sept. 30 last provides for arriving at the value of the stock by three different methods, with the provision that the tax will be assessed on the highest of the three unless some good reason is given for some lower valuation.

The bill reported by the Senate Committee on Dec. 6 provides for a tax at $1 per $1000 on the amount of net assets shown by the books in excess of $5000, and it is to be hoped that it will be adopted in this form which is equivalent to a tax on the capital and surplus shown by the books.

The war excess-profits tax was imposed by the Act of Oct. 3, 1917, and applied to the profits of the year 1917. For practical purposes it may be described as a graduated tax on the profits in excess of from 7 to 9 per cent. of the invested capital. The primary criticism of this tax is that it was called a war excess-profits tax although it was based not on war profits, but on the percentage of profits on invested capital. Secretary McAdoo said it very neatly as follows: "By an excess-profits tax we mean a tax upon profits in excess of a given return upon capital. The excess-profits tax must rest upon the wholly indefensible notion that it is a function of taxation to bring all profits down to one level with relation to the amount of capital invested and to deprive industry, foresight and sagacity of their fruits."

The new bill at present before the Senate contains provision for excess-profits tax and also war-profits tax. The orginal bill as passed by the House provided for the higher of the two taxes to be paid; the Senate bill avoids this by stating that to the excess-profits tax shall be added the excess of the war-profits tax, if any, over the excess-profits tax, but the result is the same in both cases.

Secretary McAdoo's statement regarding the war-profits tax is: "By a war-profits tax we mean a tax upon profits in excess of those realized before the war. A war-profits tax finds its sanction in the conviction of all patriotic men, of whatever economic or political school, that no one should profit largely by the war." I think we will all agree with the secretary, and I think we should all be glad to see the bill go through on this basis. The money has to be raised; everyone has expected high taxes on 1918 profits, and it would certainly be better for business to pay these taxes now and get them behind them with the expectation of lower taxes for future years rather than have the prospect of having the high taxes spread over several years.

The principal changes which affect the manufacturer are:

First, the provision for amortization of war plants. Under the 1917 act nothing more than ordinary depreciation was allowed as a deduction. Under the new act there is allowed by law as a deduction:

> In the case of buildings, machinery, equipment or other facilities, constructed, erected, installed or acquired on or after Apr. 6, 1917, for the production of articles contributing to the prosecution of the present war, and in the case of vessels constructed or acquired on or after such date for the transportation of articles or men contributing to the prosecution of the present war, there shall be allowed a reasonable duduction for the amortization of such part of the cost of such facilities or vessels as has been borne by the taxpayer, but not again including any amount otherwise allowed under this title or previous acts of Congress as a deduction in computing net income. At any time within three years after the termination of the present war the commissioner may, and at the request of the taxpayers shall, reëxamine the return, and if he then finds as a result of an appraisal or from other evidence that the deduction originally allowed was incorrect the taxes imposed by this title and by Title III for the year or years affected shall be redetermined; and the amount of tax due upon such redetermination, if any, shall be paid upon notice and demand by the collector; or the amount of tax overpaid, if any, shall be credited or refunded to the taxpayer in accordance with the provisions of Section 252.

In view of the armistice and the completion or cancellation of many large war contracts this deduction is

*Abstract of an address before the National Machine Tool Builders' Association.

of the greatest importance and seems to be most necessary and fair.

Second, the offsetting of losses against profits. Under the new bill it is provided that if a net loss is suffered by the taxpayer in any year beginning after Jan. 1, 1919, the loss may be deducted from the net income for the preceding taxable year. There is also a provision that if there were net losses during 1917 or 1918 they could be deducted in computing the income for 1919. Under the English law corporations were taxed on the average of three years, and one weakness of our previous laws has been that no offset was allowed when a company incurred a loss. This provision should go a long way to meet this objection and should prove of considerable benefit to businesses whose profits are subject to wide fluctuations.

Third, inventories. Under the 1917 act inventories had to be valued at cost or market, whichever was lower. The clause in the new bill regarding inventories is as follows:

13. If it is shown to the satisfaction of the commissioner that during the taxable year 1919 or 1920 the taxpayer (a) has for the first time ascertained the amount of a loss sustained during the preceding taxable year and not deducted from the gross income therefor, or (b) has sustained a substantial loss (whether or not actually realized by sale or other disposition), resulting from any material reduction (not due to temporary fluctuation) of the value of the inventory for the preceding taxable year, then the amount of such loss shall be deducted from the net income for such preceding taxable year, and the taxes imposed by this title and by Title III for such year shall be redetermined accordingly. Any amount found to be due to the taxpayer upon the basis of such redetermination shall be credited or refunded to the taxpayer in accordance with the provisions of Section 252.

While this would not seem to permit of inventories being taken for tax purposes at less than cost or market at the end of the taxable year it does provide relief in the event of a fall in prices before the inventory is liquidated and in probably quite a number of lines this provision will prove of great benefit, although at the present time it would appear that any fall in prices will be slower and more gradual than was generally imagined.

Fourth, interest. Since 1909 and under the 1917 act a corporation was allowed as a deduction for interest, interest on its indebtedness not in excess of the sum of its capital stock plus one-half of the interest-bearing indebtedness outstanding at the end of the year. The new act will allow the deduction of all interest paid except interest on indebtedness incurred to purchase or carry obligations of the United States issued after Sept. 24, 1917, the interest upon which is exempt from taxation for income tax. This requires some slight qualification as to war profits or excess profits taxes which we have not time to enter into here.

Fifth, dividends from corporations subject to the tax were formerly taxed at 2 per cent., but will now be free from taxation to the receiving corporation.

Sixth, the last important change is what may be called the special-relief clause. This provides for the commissioner fixing the invested capital at the rate of the industry in the following, among other, special cases:

d. Where, as compared with representative corporations engaged in a like or similar trade or business, the taxpayer would (under Section 326) be placed in a position of substantial inequality, because of the time or manner of organization, or because the actual value of the assets on March 1, 1913, was substantially in excess of the amount at which such assets would be valued for the purpose of computing invested capital under the provisions of Section 326;

e. Where the invested capital is materially disproportionate to the net income as compared with representative corporations engaged in a like or similar trade or business because:

1. The capital employed, although a material income-producing factor, is very small or is in large part borrowed;

2. There are excluded from the invested capital as computed under the provisions of Section 326, intangible assets of recognized and substantial value built up or developed by the taxpayer;

3. The net income for the taxable year is abnormally high due to the realization in one year of (a) gains, profits or income earned or accrued during a period of years or (b) extraordinary gains or profit derived from the sale of property the principal value of which has been demonstrated by prospecting or exploration and discovery work done by the taxpayer. When the tax is determined under this paragraph proper allowance shall be made for the taxes which would have been payable in prior years if the gains, profits, or income earned or accrued in such years had been taxed at the rates then applicable;

4. Proper recognition or allowance can not be made for amortization, obsolescence or exceptional depletion due to the present war, or to the necessity in connection with the present war of providing plant which will not be wanted for the purpose of the trade or business after the termination of the war.

As previously mentioned the excess-profits tax is based on the invested capital which, generally speaking and subject to certain adjustments, is the capital stock and surplus of the company. That this produced peculiar results may be seen from the following under the 1917 act: A company with common $1,000,000, preferred $1,000,000, no bonded debt, and profits of $500,000 on a 9 per cent. exemption would pay $108,396, while a company with common $1,000,000, bonds $1,000,000, and profits before bond interest of $500,000, that is, on the above assumption the company with preferred stock would pay $161,196, or about 50 per cent. less than the other company with a similar amount of bonds.

Clause 1 in the new regulations should offer some relief in cases, such as that outlined above, to offset subsequent losses. Under the new bill it is provided that if a net loss is suffered by a taxpayer in any year beginning a year after Jan. 1, 1919, the loss may be deducted from the net income for the preceding taxable year.

It would seem that an effort has been made to deal fairly with cases formerly involving hardship to the taxpayer, and if this spirit is recognized by our lawmakers it will undoubtedly tend to make the collection of taxes much easier, and taxpayers will undoubtedly pay them with much better grace.

Gaging Gear Pitch in Inaccessible Places

By A. Kipps

Here is a simple method for determining the pitch when by reason of the way in which the gear is mounted it is impracticable to get at more than a small portion of its circumference and consequently difficult either to count the teeth or measure the diameter.

Take a thin piece of sheet metal about ½ in. or so in width and cut it to 3.1416 in. in length. Bend this to conform approximately to the pitch circle and hold it up beside the teeth of the gear in question. The number of teeth spanned by the length of the piece will indicate the pitch of the gear.

SPARKS FROM THE WOR

E. C. PORTER,

Metal Trades Improving

With Governmental Restrictions Withdrawn, Factories Are Now Soliciting Orders

The barriers to getting goods are fast being removed as Government restrictions are withdrawn and Government contracts canceled. The hardware and metal trades items, such as barbed wire and galvanized sheet iron and corrugated roofing, have for many months been unobtainable by the domestic trade. Now the factories are out soliciting orders for these goods and promising prompt shipments.

Some other products—wire nails and automobile casings, for instance—could be had only in limited quantities and under strict Government regulations. Now the lid is off, and the factories are anxious for business.

Other lines, such as files and twist drills, among mechanics' tools were practically commandeered for Government use during the war. Now the manufacturers of these goods advise the trade that they expect shortly to take care of their regular business without any difficulty.

Still other lines, such as axes and saws, had largely ceased making their regular output and were devoting their capacity to munitions of war. Now their entire plants are back in the regular channels.

* * *

Padded Winter Suits for Shipworkers

The experience of last winter, when shipworkers suffered by having to work out of doors during the coldest weather with the thermometer at times 19 deg. below zero, has prompted the Emergency Fleet Corporation to make preparations for the comfort of the workers this winter. Orders have been given Eastern manufacturers for several hundred warmly padded suits that will be available for workers who are exposed to the cold. The costume is shown herewith, and it was recently given exhaustive tests by the United States Bureau of Standards, coming through with fine results. The test included the tensile strength of material used, heat-transmission qualities, permeability to air, permeability to water and laundering. The tests for heat transmission and permeability were made in comparison with the standard 5-lb. wool army blanket, and the results would indicate that garments made from this material should furnish ample protection.

In this outfit the worker can get the benefit of working out of doors without many of the discomforts. A wearer of one of these suits is posed to show the freedom of action possible and the care taken to avoid bulkiness in garments which might lead to accidents.

The shirt and trousers are padded, but despite this, they fit snugly to the body, and the sleeves are of generous length, to come well down on the wrists. The collar is very wide and ar-

Big Handy Pockets
Heavy Folding Collar
Plenty of Shoulder Elbow and Knee Room
Snug Waist
Close Fitting Ankles and Wrists

ranged to fold up closely about the ears and back of the head.

The trousers fit snugly around the ankles, thus keeping out wind and minimizing the chance of accidents that wide and loose trousers legs might give.

The material of the suit is in three plies, an outer cover of one-ply olive drab, very closely woven cotton drill, one-ply of cotton lap padding, approximately 6 oz., 20 per cent. wool and a lining of one-ply No. 250 cotton drill.

Lieutenant-Colonel Doane, until recently head of the Health and Sanitation Division, who goes to France soon to take charge of an Evacuation Hospital, obtained one of the suits to wear during rigorous weather.

* * *

Jobs for Chicago Soldiers

The chairmen of 88 draft boards, after conferences with representatives of the Illinois Manufacturers' Association and the Association of Commerce, authorize the statement that there will be jobs waiting for the 175,000 soldiers and sailors who entered the service from Chicago when they return. Those who do not receive their former positions will be promoted to better ones, it is said. The men will be provided with transportation to Chicago after they are mustered out.

* * *

A Thousand Cars a Day

There was an average daily delivery of 1026 cars of export material at the port of New York during October.

Chevrons of Silver for Army Over Here

General March, chief of staff, by direction of President Wilson, recently issued an order that officers and men of the army who failed to reach the fighting front because of duties in this country will not be denied recognition of their service in winning the war, and that they shall be entitled to wear a silver chevron similar to the gold one for service overseas. The order says:

"The President desires, on behalf of the nation, to express his appreciation of the vitally essential and self-sacrificing service given by officers and men whom military necessity has held and is holding for performance of duties outside the theater of active operations but whose contribution to military success is no less than that of those who have had opportunity for service at the front. On them devolved the creation of the great armies of the nation and their supply with the equipment and stores indispensable to military operations. Without them the troops abroad could have accomplished nothing."

Officers and men will be entitled to wear one silver chevron for each six months of service.

* * *

New Course in Tool Drafting and Design

The Polytechnic Institute of Brooklyn will open after Jan. 1 an evening class to men having a good knowledge of mechanical drawing and modern machine-shop practice. The course will include a study of the various systems employed by modern tool departments for carrying their tool work through the subdepartments.

Two other new evening courses will be started about the same time: theory of aeronautical engineering, and marine engineering, the prerequisites for both being that a man shall be a college graduate or that he shall have had adequate training equivalent in a general way to that given in the first two years of a technical college.

* * *

Record Claimed for Oxyacetylene Torch Cutting Out Rivets

An operator employed by the Submarine Boat Corporation, Newark, N. J., claims a record, which was witnessed, timed and sworn to, of having cut out with his oxyacetylene torch 123 3-in. countersunk rivets from an oil-tank cover in 55 min. The work was so well done that the rivets came out with one stroke of the maul and punch.

LD'S INDUSTRIAL FORGE

NEWS EDITOR

Manufacturers of Machine Tools Dine at Harvard Club

About 100 manufacturers of machine tools representing nearly every section of the country were tendered a dinner at the Harvard Club, New York, on Monday, Dec. 9, by the Allied Machinery Co. of America.

J. W. Hook, president of the Allied Machinery Co., presided and during the speeches considerable prominence was given to foreign trade in machinery. Those who spoke were: Frank A. Vanderlip, president of the National City Bank; G. J. Baldwin, head of the Hog Island Shipyard; C. A. Stone, American International Corporation; J. B. Doan, American Tool Works Co., Cincinnati; E. J. Kearney, Kearney & Trecker Co., Milwaukee; R. P. Tinsley, American International Corporation, and Roger P. Redier, Allied Machinery Co. Mr. Redier will go abroad shortly and his first work in Europe will be in connection with the reëstablishment of the Belgian agency of the Allied Machinery Co. of America.

* * *

Lifting the Export Ban

The War Trade Board has removed nearly 500 commodities from the export conservation list. These include various alloys and metals, tin in certain forms, iron and steel of certain kinds, machinery and tools, aeronautical machines and instruments, marine engines, instruments and appliances, dental and surgical instruments, locomotives, blast and steel furnaces, hardware (including pipe, wire, and nails), railroad-building materials and certain appliances, chemicals and drugs, animal hair, and articles manufactured from rubber. The board also made some modifications in the rules governing the kinds of iron and steel and vegetable fiber, except cotton, hemp and other fibers, which may be exported.

* * *

A Two-Seater Monoplane Makes Speed and Height Records

The Loening two-seater monoplane in recent tests at Dayton, Ohio, developed 145 miles an hour with full military load, including four guns, which exceeds any performance made by a European single-seater combat machine. The Loening plane in these tests also climbed 25,000 ft., carrying two passengers, in remarkable time, thereby establishing another new record.

Air service officers have watched the tests of this monoplane with great interest. It is American designed and American built and its construction embodies several original ideas. Smaller than the De Haviland 4, which is a bomber and reconnaissance machine, it weighs only about 2400 lb. loaded for the air, which is practically the weight of a single-seater scout. It is driven

by an eight-cylinder, 300-hp. Hispano-Suiza engine, and the whole power plant is a unit construction and may be easily removed from the body of the plane. Several original ideas are also carried out in the understrutting, and the arrangement of the seats gives the pilot twice the vision of other combat machines. The plane carries fuel for three and one-half hours.

Grover Cleveland Loening, the designer and builder, is an American. He has been an aeronautical engineer in this country for the last eight years, is the author of textbooks used by American flying cadets, and has been given the degree of bachelor of science by Columbia University and of master of arts and civil engineer by New York University.

* * *

Prices of Wooden Ships Fixed

The Shipping Board has fixed $700,000 as the price for each of the 3500-ton wooden ships which were designed for ocean-going traffic and which it now desires to sell to private owners. Where the ships are purchased in lots of five the price will be $675,000 each. Offers have been received from both foreign and domestic buyers.

Development of Mustard Gas

Largest Plant in the World Near Baltimore in Full Operation in Less Than Twelve Months

Twenty-six miles from Baltimore, on the edge of the Government's vast Aberdeen ordnance proving grounds, is a 300-acre tract fenced and amply guarded. Twelve months ago it was a Maryland farm. Today it is the largest poison-gas factory on earth. It can produce probably three or four times more mustard gas, phosgene, chlorine and other noxious fumes than the intensified war output of England, France and Germany combined. Now it lies silent and idle like the great cannon along the Lorraine border, but ready to operate at a moment's notice.

It was in October, 1917, that the Government decided to manufacture poison gas on a scale commensurate with the rest of our military preparations. It was in November, 1917, that ground was broken, and in less than 12 months the factory was in full operation.

The factory is a city of brick kilns, high chimneys, correlated vats in innumerable series, repeated shot towers, miles of railway and elevated pipe lines, machinery of the finest type and the most perfect installation housed in concrete and sheet iron and built apparently for permanence. It is only a few miles from Gunpowder Creek, which runs into Chesapeake Bay, so that vessels loaded with the gases direct from the factory sailed to Havre without a stop.

Salt, sulphur and alcohol are used in the mustard gas, the phosgene and phosphorus, the chlorine, etc., that have been found efficacious in warfare. For some of the work vast refrigerators were built, covering acres. Half a mile away are enormous boilers and hot rooms for fusing. There are curious steel structures looking like miniature Eiffel towers scattered about the grounds, supporting pipes down which are dropped chemicals causing them to mix.

The most remarkable thing about this plant, it is said, is that when the Government started to build it there were no models for some of the machinery and it had to be literally invented while the factory was being built.

In the beginning, while building roads and putting in foundations, no difficulty was experienced with labor, but when the first vats were installed and it became known among the workmen that the poison was being produced the real trouble began.

One day last summer along came an

ox team kicking up an enormous cloud of dust. Some carpenters working in the woods saw it, and someone started the cry, "A poison tank has burst!" That was enough. Those carpenters started for the railroad two miles away, and as they ran they fast picked up company. By the time they reached the tracks there were 2000 or 3000 laborers in a panic-stricken flight. The block signaler on the railroad saw them coming, set all his blocks, and ran. For three hours that afternoon the entire Pennsylvania system was tied up. In a bunkhouse eight negroes were sleeping, and it being a hot afternoon they were devoid of clothing. They heard the false alarm as the van of the flying crowd passed, leaped from their bunks, and ran naked down the tracks, reached an empty box car that had escaped the block set, entered it and were seen no more. They didn't even send for their clothes or ask for their pay.

Finally it was found that no one would do the work and the army was then detailed for the purpose. When the armistice was signed more than 7000 drafted American citizens were doing the work for $30 a month.

After all the figures are published it may appear that no division in France has a higher percentage of casualties than the Edgewater arsenal in Baltimore (the official name of the poison-gas plant) had in August, 1918, the month of excessive heat when the gases were most volatile and when the weather made the soldiers relax somewhat their vigilance in avoiding accident. The hospitals were filled at the rate of 3½ per cent. of the entire force a day, or 100 per cent. a month.

Mustard gas has been found for all-around purposes to be the most effective in warfare, because it advances comparatively easily and also because it is the most difficult to protect against.

It was intended to have containers that would hold a ton of mustard gas carried over fortresses like Metz and Coblenz by plane, and released with a time fuse arranged for explosion several hundred feet above the forts. The mustard gas, being heavier than air, would then slowly settle while it also dispersed. A one-ton container could thus be made to account for perhaps an acre or more of territory.

Edgewater arsenal was closed down the day the armistice was signed, having more than 2500 tons waiting on the piers ready for shipment. It is now being dismantled, and the machinery carefully taken apart, oiled, wrapped and stored away ready for the next war, should there ever be one. The parts that have come in contact with the gas are taken by means of tongs to the fields and buried. The gas itself will perhaps be taken to sea some day and dropped overboard. Being heavier than water it will settle to the bottom.

Of the $72,000,000 expenditure there is one bit of salvage—a little 15-ton consignment of brombenzylcyanide. This is an intense lachrymator (tear compeller) that has the effect of blinding people for six or eight hours. After the temporary blindness the afflicted recover their normal eyesight. It has been suggested that this brombenzylcyanide might be kept in every police station throughout the country, in little cans with spraying nozzles, for use against mobs.

In the course of the experimental work in the laboratory the chemists discovered new gas combinations, as yet unknown to anyone in Europe or Asia, and more effective than phosgene or mustard gas. They were discovered so recently that there was no time to utilize them.

Personals

G. C. BAUMANN, who was general foreman of the Advance Machinery Co., Van Wert, Ohio, is now chief inspector of the Rich Tool Co., Chicago, Ill.

JOSEPH MEYERSON of the Walter A. Zelnicker Supply Co., St. Louis, Mo., has been made secretary to the president. Mr. Meyerson was associated for 10 years with the Southwestern Traffic Bureau, latterly as secretary to F. A. LELAND.

S. S. NEWTON, vice president of the Luther Grinder Manufacturer Co., Milwaukee, Mich., was recently elected president of the company to fill the vacancy caused by the death of Clarence J. Luther. FRANKLIN P. MANN has succeeded Mr. Newton as vice president. A. D. RACE is the secretary and treasurer.

FRANK J. VOGEL, master mechanic of the Badger Bag and Paper Co., Wausau, Wis., and more recently connected with the Union Bag and Paper Corporation, New York and Chicago, has been appointed resident manager of the Victory Bag and Paper Co., Marinette, Wis., with sales offices at 222 West Kinzie St., Chicago. Mr. Vogel has been actively engaged in the manufacture of paper bags and paper-bag machinery for the last 15 years.

Business Items

The Independent Pneumatic Tool Co. has opened a branch office and service station in Cleveland, Ohio. A complete line of Thor pneumatic and electric tools and repair parts will be carried in stock at 1103 Citizens' Building. Hayden F. White, who has represented the company in the Detroit, Chicago and Milwaukee districts for some years, will be the manager.

L. E. Townsley manager of the foreign-trade department of Paul R. Ruben & Co., 16 California St., San Francisco, Calif., leaves the last of January for China, Japan, the Phillippines, Dutch East Indies, Straits Settlements and Australasia to establish resident agents at the principal ports of these countries. Correspondence is invited with American manufacturers desiring to increase their foreign trade.

B. F. Sturtevant Co., Boston, Mass., on Jan. 1, 1919, will discontinue as selling agents for Riley stokers. After that date all inquiries for this apparatus should be addressed to the Sanford Riley Stoker Co., Worcester, Mass. The Sturtevant company will retain its present staff of combustion engineers and continue the manufacture and sale of forced and induced draft apparatus and Sturtevant fuel economizers.

The Woonsocket Machine and Press Co., Inc., Woonsocket, R. I., is the name of a company recently organized and incorporated in Rhode Island, and which has taken over the Willet & Sears interests of Boston, which formerly controlled the Woonsocket Machine and Press Co. The transfer includes all land, buildings, patents and good-will, including the machinery and equipment used in the manufacture of textile machines.

Obituary

J. H. GEIGES, superintendent and general manager of the Machine Tool and Supply Co., Davenport, Iowa, was killed in an automobile accident Sunday, Dec. 8, 1918.

W. F. CURTIS, for the last 33 years manager of the New York office of the Union Manufacturing Co., New Britain, Conn., died at his home, 117 Midland Ave., Montclair, N. J., Sunday, Dec. 8, 1918.

HERBERT C. SEVERANCE, secretary and general sales manager of the Racine Rubber Co. and a director of the Ajax Rubber Co. of Racine, Wis., died recently. He was made general sales manager of the Racine Rubber Co. in November, 1913, and later elected secretary.

HENRY CLIFTON BULLARD, son of August H. Bullard, died at his home, 96 Eaton St., Bridgeport, Conn., on Dec. 9, 1918, from pneumonia. Mr. Bullard was 28 years of age, and was well known in the machinery field. He was purchasing agent for the Bullard Machine Tool Co., of which his father is the secretary and treasurer. He was a member of the Seaside Club, the Weatogue Country Club, the Chamber of Commerce and Purchasing Agents' Association.

EDWARD V. MCCONVILLE died on Nov. 26, 1918, of double pneumonia following an attack of influenza. He was born in Northampton, Mass., in 1885 and educated at Toronto University. Mr. McConville entered the employment of the General Electric Co., Schenectady, N. Y., and later went to Erie, Penn., as private secretary to Mr. Reynolds, engineer of construction of the General Electric Erie plant. In 1911 he joined the sales organization of the Modern Tool Co. and for two years traveled through the New England states and New York. Since 1913 he has been the sales manager and secretary of the Modern Tool Company.

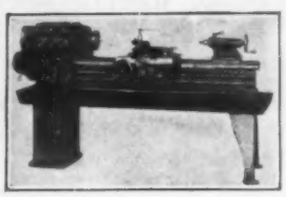
Condensed-Clipping Index of Equipment

Clip, paste on 3 x 5-in. cards and file as desired

Lathe, Geared-Head

Willard Machine Tool Co., Inc., Cincinnati, Ohio

"American Machinist," Dec. 5, 1918



Headstock is of box section ribbed internally, there being six direct gear speeds, six further speeds being available by means of back gears. Chrome-nickel steel gears are used throughout with the exception of the base gear, which is made of cast iron as a safety feature. Swing over bed, 13¼ in.; swing over carriage, 7¼ in.; distance between centers with 6-ft. bed, 38 in.; travel of tailstock spindle, 5¼ in.; diameter of tailstock, 1¾ in.; taper of centers, Morse No. 3; number of spindle speeds, 12.

"Keg Konveyor"

Kent Machine Co., Kent, Ohio

"American Machinist," Dec. 5, 1918

Said to be of great value in the rapid moving of kegs with either a light or heavy load. In operation the device is pushed up against the bottom of the keg and the wire loop is thrown over the keg when a backward movement of the handle will lift the keg from the floor. Two spurs at the lower part of the device help to pick up the heaviest load and prevent the keg from slipping in transportation. All wooden parts of the conveyor are made of ash, while metal parts are of wrought iron.

Lathe, Shell-Boring, Type 68 RC

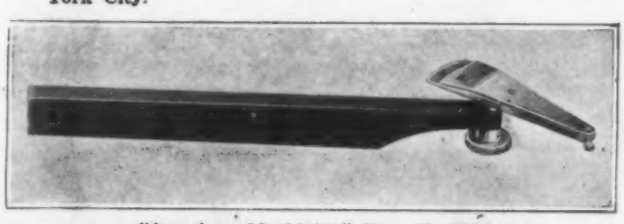
R. M. Eddy Foundry Co., Chicago, Ill.

"American Machinist," Dec. 5, 1918.

This machine is intended for boring the center true with the interior of the projectile. Swing over bed, 28 in.; front spindle bearing, 7 x 14 in.; rear spindle bearing, 5 x 12 in.; width of carriage guide, 7¼ in.; area of carriage bearing, 264 sq.in.; length of carriage guide, 24 in.; driving clutch pulley, 18 x 6 in.; floor space required, 3 ft. by 9 ft. 6 in.; approximate weight, 8500 pounds.

Indicator, Universal Test

Manufactured by the Ideal Tool Co., 57 Cathage St., Rochester, N. Y., and sold by Johnson & Miller, 42 Murray St., New York City.



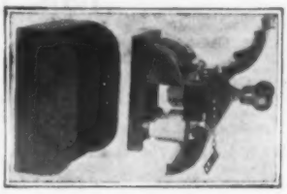
"American Machinist," Dec. 19, 1918

Made with a body of drawn stock and working parts of hardened tool steel moving in bronze bushings. The contact point is spherical in shape and can be turned to 90 deg. on either side of the indicator by simply pushing it into the desired position. A friction device is incorporated to protect the point in case the work is pressed too hard against the contact point. Indicates on either side of the zero point, the scale being graduated.

Switch, Protective Plug, CR 1038

General Electric Co., Schenetady, N. Y.

"American Machinist," Dec. 5, 1918

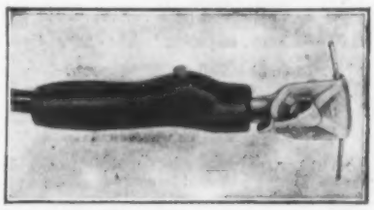


This switch has been designed for connecting alternating-current motors up to 3 hp., 110 volts, and 5 hp., 220, 440 or 550 volts, direct to the line. The entire device consists of a quick make-and-break switch, below which and inside the sheet-metal case are mounted the time overload protective plugs. By reason of the time-lag feature any momentary inrush of current such as at starting will not cause the plug to open the circuit.

Electrode Holder for Arc-Welding

Arc Welding Machine Co., Inc., 220 West 42nd St., New York City

"American Machinist," Dec. 5, 1918



It is claimed that this allows the rapid changing of electrodes, but that it holds the electrode firmly enough so that it may be pulled free in case it freezes to the work. The welding current enters at the rear through the end of the composition shank, which holds the electrode, there being no joint except where the cable is soldered into the shank. The electrode is clamped by a cam-shaped segment so installed that any tendency to pull out the electrode results in tightening the grip of the segment, which is made of casehardened steel. The trigger shown on the top is used for the remote control employed with the closed-circuit system manufactured by this company.

Lathe, Shell-Turning, Type 68 COC

R. M. Eddy Foundry Co., Chicago, Ill.

"American Machinist," Dec. 5, 1918

This machine is especially adapted for cutting off the open end and centering and testing projectile forgings. The centering carriage is air operated and the spindle is driven by an auxiliary motor mounted on top of the slide as shown. Swing over bed, 28 in.; front spindle bearing, 12¼ x 14 in.; rear spindle bearing, 8 x 10 in.; width of carriage guide, 8 in.; area of carriage bearing, 408 sq.in.; length of carriage guide, 30 in.; driving clutch pulley, 18 x 6 in.; standard gearing ratio, 8¾ to 1; pitch of gearing, 4; floor space required, 3 ft. 6 in. by 10 ft.; approximate weight, 9000 pounds.

Trucks, Lift, Models H and Y

Barrett-Cravens Co., Transportation Building, Chicago, Ill.

"American Machinist." Dec. 19, 1918

Both trucks are made in eight styles and are for loads of 5000 lb., model H having a width of 20 in., and model Y a width of 27 in. They are built in lengths of 42, 48 and 60 in., and their heights when lowered are 7, 9 or 10 in., or higher on special order. In lifting, the handle connects directly into the upper frame, there being no connecting links to break or get out of order. The handle is automatically disengaged from the upper frame when the load is raised and remains either upright or drops to 15 in. from the floor. Hyatt roller bearings are used, and the axles are of 1¼-in. alloy nickel steel. The turntable is ⅞ in. above the axle and has a diameter of 5 inches.

Patented August 20, 1918

WEEKLY PRICE GUIDE OF

IRON AND STEEL

PIG IRON—Quotations compiled by The Matthew Addy Co.:

	Current	One Month Ago
CINCINNATI		
No. 2 Southern	$37.60	$37.60
Northern Basic	34.80	34.80
Southern Ohio No. 2	35.80	35.80
NEW YORK, Tidewater delivery		
Penna. 2X	39.55	39.15
Virginia No. 2	41.70	41.70
Southern No. 2	41.70	41.70
BIRMINGHAM		
No. 2 Foundry	34.00	34.00
PHILADELPHIA		
Eastern Pa. 2X	39.15*	38.85*
Virginia No. 2	40.50†	40.50†
Basic	36.90*	36.60*
Grey Forge	36.90*	36.60*
Bessemer	39.10*	38.80*
CHICAGO		
No. 2 Foundry Local	34.50	34.50
No. 2 Foundry Southern	39.00	39.00
PITTSBURGH, including freight charge from the Valley		
No. 2 Foundry Valley	35.40	35.40
Basic	34.40	34.40
Bessemer	36.60	36.60

* F.o.b. furnace. † Delivered.

STEEL SHAPES—The following base prices per 100 lb. are for structural shapes 3 in. by ¼ in. and larger, and plates ¼ in. and heavier, from jobbers' warehouses at the cities named:

	New York			Cleveland		Chicago	
	Current	One Month Ago	One Year Ago	Current	One Year Ago	Current	One Year Ago
Structural shapes	$4.27	$4.245	$4.20	$4.17	$4–4.04	$4.27	$4.20
Soft steel bars	4.17	4.145	4.10	4.17	4–4.04	4.17	4.10
Soft steel bar shapes	4.17	4.145	4.10	4.17	4.14	4.17	4.10
Soft steel bands	4.77	4.995					
Plates, ¼ to 1 in. thick	4.52	4.495	4.45	4.42	4.39	4.25	4.45

BAR IRON—Prices per 100 lb. at the places named are as follows:

	Current	One Year Ago
Pittsburgh, mill	$3.50	$4.75
Warehouse, New York	4.75	4.75
Warehouse, Cleveland	4.67	4.95
Warehouse, Chicago	4.10	4.50

STEEL SHEETS—The following are the prices in cents per pound from jobbers' warehouse at the cities named:

	New York			Cleveland		Chicago	
	Pittsburgh, Mill, in Carloads	Current	One Month Ago	One Year Ago	Current	One Year Ago	Current	One Year Ago
*No. 28 black	5.00	6.52	6.495	6.445	6.00	6.45	6.52	6.445
*No. 26 black	4.90	6.42	6.395	6.405	5.90	6.35	6.42	6.405
*Nos. 22 and 24 black	4.85	6.37	6.345	6.295	5.85	6.30	6.37	6.295
Nos. 18 and 20 black	4.80	6.32	6.295	6.245	5.80	6.25	6.32	6.245
No. 16 blue annealed	4.45	5.72	5.695	5.645	5.20	5.65	5.72	5.645
No. 14 blue annealed	4.35	5.62	5.595	5.545	5.12	5.55	5.62	5.545
No. 10 blue annealed	4.25	5.52	5.495	5.445	5.05	5.45	5.52	5.445
*No. 28 galvanized	6.25	7.77	7.745	7.695	7.25	7.70	7.77	7.695
*No. 26 galvanized	5.95	7.47	7.445	7.395	6.95	7.40	7.32	7.395
No. 24 galvanized	5.80	7.32	7.295	7.245	6.80	7.25	7.47	7.245

* For painted corrugated sheets add 30c. per 100 lb. for 25 to 28 gage; 25c. for 19 to 24 gages; for galvanized corrugated sheets add 5c., all gages.

COLD DRAWN STEEL SHAFTING—From warehouse to consumers requiring at least 1000 lb. of a size (smaller quantities take the standard extras) the following discounts hold:

	Current	One Year Ago
New York	List plus 13%	List plus 25%
Cleveland	List plus 11%	List
Chicago	List plus 13%	List plus 10%

DRILL ROD—Discounts from list price are as follows at the places named:

	Extra	Standard
New York	35%	40%
Cleveland	35%	40%
Chicago	35%	40%

SWEDISH (NORWAY) IRON—The average price per 100 lb., in ton lots is:

	Current	One Year Ago
New York	$15.50–19	$14.00
Cleveland	20.00	15.00
Chicago	19.00	15.50

In coils an advance of 50c. usually is charged.
Note—Stock very scarce generally.

WELDING MATERIAL (SWEDISH)—Prices are as follows in cents per pound f.o.b. New York, in 100 lb. lots and over:

Welding Wire*		Cast-Iron Welding Rods	
1/16, 3/32, 1/8, 5/32, 3/16 No. 8, 7/32 and No. 10	22.10 to 33.00	1/4 by 12 in. long	16.00
No. 12		5/16 by 19 in. long	14.00
7/32, No. 14 and 1/4		3/8 by 19 in. long	12.00
No. 18		1/2 by 21 in. long	12.00
No. 20			

* Very scarce.

* Special Welding Wire

1/16	33.00
3/32	30.00
1/8	38.00

MISCELLANEOUS STEEL—The following quotations in cents per pound are from warehouse at the places named:

	New York Current	Cleveland Current	Chicago Current
Openhearth spring steel (heavy)	8.00	8.00	7.50
Spring steel (light)	10.00	11.25	11.75
Coppered bessemer rods	9.00	8.00	7.07
Hoop steel	4.77	4.75	4.77
Cold-rolled strip steel	8.02	8.25	8.57
Floor plates	6.27	6.00	6.25

PIPE—The following discounts are for carload lots f.o.b. Pittsburgh; basing card of Nov. 6, 1917, for steel pipe and for iron pipe:

BUTT WELD

Steel Inches	Black	Galvanized	Iron Inches	Black	Galvanized
1/8, 1/4, and 3/8	44%	17½%	1/8 to 1¼	33%	17%
1/2	48%	33½%			
3/4 to 3	51%	37½%			

LAP WELD

2	44%	31½%	2	26%	12%
2½ to 6	47%	34½%	2½ to 4	28%	15%
			4½ to 6	28%	15%

BUTT WELD. EXTRA STRONG PLAIN ENDS

1/8, 1/4 and 3/8	40%	22½%	1/8 to 1¼	33%	18%
1/2	45%	32½%			
3/4 to 1¼	49%	36½%			

LAP WELD. EXTRA STRONG PLAIN ENDS

2	42%	30½%	2	27%	14%
2½ to 4	45%	33½%	2½ to 4	29%	17%
4½ to 6	44%	32½%	4½ to 6	28%	16%

Stock discounts in cities named are as follows:

	New York Black	New York Galvanized	Cleveland Black	Cleveland Galvanized	Chicago Black	Chicago Galvanized
1/8 to 3 in. steel butt welded	40%	28%	41%	26%	41.1%	26.1%
3½ to 3 in. steel lap welded	36%	25%	37%	23%	37.1%	23.1%

Malleable fittings. Class B and C, from New York stock sell at list + 15%. Cast iron, standard sizes, 5% off.

METALS

MISCELLANEOUS METALS—Present and past New York quotations in cents per pound, in carload lots:

	Current	One Month Ago	One Year Ago
Copper, electrolytic	26.00*	26.00	23.50
Tin in 5-ton lots	72.00	83.00	86.00
Lead	7.05	8.55	6.50
Spelter	8.60	9.50	7.75

* Government price.

ST. LOUIS

Lead	6.75	8.25	6.38
Spelter	8.25	9.25	7.50

At the places named, the following prices in cents per pound prevail, for 1 ton or more:

	New York			Cleveland		Chicago	
	Current	One Month Ago	One Year Ago	Current	One Year Ago	Current	One Year Ago
Copper sheets, base	38.00	38.00	35.00	38.00	35.00	36.00	35.00
Copper wire (carload lots)	35.00	35.00	36.00	35.00	31.00	33.00	33.50
Brass sheets	39.75	39.75	35.75	40.50	34.00	33.50	35.00
Brass pipe	46.00	46.00	38.50	42.50	46.50	44.00	41.00
Solder (half and half) (case lots)	55.00	58.00	40.50	47.00	43.25	56.00	41.00

Note:—Solder very scarce.

Copper sheets quoted above hot rolled 16 oz., cold rolled 14 oz. and heavier, add 1c.; polished takes 1c. per sq.ft. extra for 20-in. widths and under; over 20 in., 2c.

BRASS RODS—The following quotations are for large lots, mill, 100 lb. and over, warehouse; 25% to be added to mill prices for extras; 50% to be added to warehouse price for extras:

	Current	One Year Ago
Mill	$16.00	$19.00
New York	18.40	20.00
Cleveland	18.50	24.00
Chicago	19.50	17.00

SHOP MATERIALS AND SUPPLIES

ZINC SHEETS—The following prices in cents per pound prevail:

Carload lots f.o.b. mill 15.00

	In Casks		Broken Lots	
	Current	One Year Ago	Current	One Year Ago
Cleveland	18.75	21.00	18.40	21.50
New York	17.00	20.00	17.50	20.25
Chicago	22.00	21.00	21.50	21.50

ANTIMONY—Chinese and Japanese brands in cents per pound, in ton lots, for spot delivery, duty paid:

	Current	One Year Ago
New York	9.50–10.50	15.00
Chicago	10.00	17.00
Cleveland	11.62½	16.00

OLD METALS—The following are the dealers' purchasing prices in cents per pound:

	New York		Cleveland		
	Current 1918	One Year Ago	Current 1918	One Year Ago	Chicago
Copper, heavy and crucible	20.00	22.00	19.00	21.00	17.00
Copper, heavy and wire	19.00	21.00	18.00	21.00	16.50
Copper, light and bottoms	17.00	19.00	15.00	19.00	15.00
Lead, heavy	6.00	5.50	6.00	6.00	5.50
Lead, tea	4.75	4.00	4.00	5.00	5.25
Brass, heavy	11.00	14.25	14.00	14.50	16.50
Brass, light	9.00	10.50	13.00	11.50	10.00
No. 1 yellow brass turnings	11.00	14.00	10.00	13.50	10.50
Zinc	5.25	5.00	5.00	5.50	5.25

ALUMINUM—The following prices are from warehouse at places named:

	New York	Cleveland	Chicago
No. 1 aluminum, guaranteed over 99% pure, in ingots for remelting (1-15 ton lots), per lb	33.20c.	32.30c.	33½c.

This is the Government price for lots of from 1 to 14 tons.

COPPER BARS from warehouse sell as follows in cents per pound, for ton lots and over:

	Current	One Year Ago
New York	32.00	40.00
Chicago	38.00	40.00
Cleveland	36.50	33.50

BABBITT METAL—Warehouse price per pound:

	New York		Cleveland		Chicago	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Best grade	87.00	70.00	80.00	93.00	75.00	70.00
Commercial	42.00	40.00	21.50	21.50	15.00	25.00

SHOP SUPPLIES

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	New York		Cleveland		Chicago	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Hot pressed square	$0.80	1.00	$1.25	$1.40	$0.98	$1.05
Hot pressed hexagon	.80	1.00	1.05	1.20	.78	.85
Cold punched hexagon	2.50*	1.00	.75	.75	1.00	1.50
Cold punched square	2.50*	1.00	.75	.75	1.00	1.50

* List plus.

Semi-finished nuts sell at the following discounts from list price:

	Current	One Year Ago
New York	50–10%	50%
Chicago	50%	45%
Cleveland	50–10%	50%

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago
½ by 4 in. and smaller	40–10%	40–10%	37%
Larger and longer up to ½ in. by 30 in.	20–5%	20–5%	25–5%

WASHERS—From warehouses at the places named the following amount is deducted from list price:

For wrought-iron washers:

New York $2.00 Cleveland $1.50 Chicago $2.50

For cast-iron washers the base price per 100 lb. is as follows:

New York $6.00 Cleveland $4.25 Chicago $4.50

CARRIAGE BOLTS—From warehouses at the places named the following discounts from list are in effect:

	New York	Cleveland	Chicago
½ by 4 in. and smaller	40%	45%	32½%
Larger and longer up to 1 in. by 30 in.	20–5%	20–5%	20%

COPPER RIVETS AND BURS sell at the following rate from warehouse:

	Rivets		Burs	
	Current	One Year Ago	Current	One Year Ago
Cleveland	List plus 10%	List plus 10%	List plus 10%	List price
Chicago	List price	List price	List plus 20%	List price
New York	15% from list	10% from list	List plus 5%	10-2½% from list

RIVETS—The following quotations are allowed for fair-sized orders from warehouse:

	New York	Cleveland	Chicago
Steel ½ and smaller	40%	45–5%	40%
Tinned	30%	45–5%	40%

Boiler, ½, ¾, 1 in. diameter by 2 in. to 5 in. sell as follows per 100 lb.:

New York $5.675 Cleveland $5.15 Chicago $5.67 Pittsburgh $4.65

Structural, same sizes:

New York $5.775 Cleveland $5.25 Chicago $5.77 Pittsburgh $4.75

MISCELLANEOUS

SEAMLESS DRAWN TUBING—The base price in cents per pound from warehouse in 100-lb. lots is as follows:

	New York	Cleveland	Chicago
Copper	52.00	40.00	44.00
Brass	49.00	38.00	41.00

For immediate stock shipment 3c. is usually added. The prices of course vary with the quantity purchased. For lots of less than 100 lb., but not less than 75 lb., the advance is 2c.; for lots of less than 75 lb., but not less than 50 lb., the advance is 5c. over base (100-lb. lots); for less than 50 lb. but not less than 25 lb., 10c. should be added to the base price; and for quantities of from 10 to 25 lb. the extra is 25c.; less than 10 lb., add 35c.

Double above extras will be charged for angles, channels and sheet-metal mouldings if ordered in above quantities. The above extras also apply to brass rod other than standard stock sizes—stock sizes being considered as ¼ up to 2 in. inclusive in rounds, and ½ up to 1½ in. inclusive in square and hexagon—all varying by thirty-seconds up to 1 in. and by sixteenths over 1 in. On all shipments aggregating less than 100 lb. there is usually a boxing charge of $1.50.

TIN PLATES—Warehouse prices per box:

Coke tin plate, 14 x 20:

	Cleveland		Chicago	
	Current	One Yr. Ago	Current	One Yr. Ago
100 lb	$9.17½	$12.00	$10.60	$11.75
I. C. 107 lb	9.42½	12.17½	10.70	11.90

Terne plate, 20 x 28:

Base Weight	Net Weight	Coating				
100 lb.	200	3		18.95	18.95	19.10	17.90
I. C.	214	8		19.25	19.25	19.40	18.25
I. C.	270	8		21.75	21.75	21.40	20.35
I. C.	218	12		21.75	21.75	22.60	19.25
I. C.	221	15		22.50	22.50	22.10	19.50
I. C.	226	30		23.25	23.25	22.60	20.50
I. C.	231	25		24.50	24.50	23.10	21.30
I. C.	236	30		25.75	25.75	23.60	22.25
I. C.	241	35		26.75	26.75	25.10	23.25
I. C.	246	40		28.00	28.00	25.60	24.55

NOTE—New York prices furnished on application to dealers. Price varies according to whether the plates are wanted for work essential to the war or for nonessential work.

COTTON WASTE—The following prices are in cents per pound:

	New York		Cleveland	Chicago
	Current	One Year Ago		
White	11.00 to 13.00	13.00	16.50	12.00 to 16.50
Colored mixed	8.50 to 12.00	12.00	13.00	11.50 to 14.00

WIPING CLOTHS—Jobbers' price per 1000 is as follows:

	13½ x 13½	13½ x 20½
Cleveland	52.00	58.00
Chicago	48.00	50.00

SAL SODA sells as follows per 100 lb.:

	Current	One Month Ago	One Year Ago
New York	$1.75	$1.75	$1.75
Philadelphia	1.75	1.75	1.75
Cleveland	2.62½	2.40	2.35
Chicago	2.00	2.00	2.00

ROLL SULPHUR in 360-lb. bbl. sells as follows per 100 lb.:

	Current	One Month Ago	One Year Ago
New York	$3.65	$4.30	$4.30
Cleveland	4.25	4.60	4.50
Chicago	4.50	4.00	4.00

COKE—The following are prices per net ton at ovens, Connellsville, and cover the past four weeks:

	Dec. 19	Dec 12	Dec. 5	Nov. 28	Nov. 21
Prompt furnace	$6.00	$6.00	$6.00	$6.00	$6.00
Prompt foundry	7.00	7.00	7.00	7.00	7.00

FIRE CLAY—The following prices prevail:

		Current
Chicago	450-lb. bbl.	$2.50
Cleveland	375-lb. bag	2.50

LINSEED OIL—These prices are per gallon:

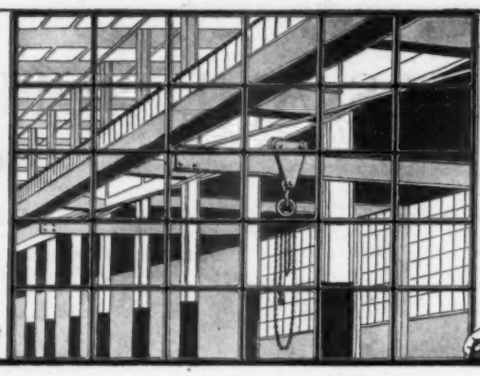
	New York		Cleveland		Chicago	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Raw in barrels	$1.59	$1.25	$1.90	$1.25	$1.77	$1.22
5-gal. cans	1.84	1.35	2.00	1.40	1.97	1.32

WHITE AND RED LEAD in 500-lb. lots sells as follows in cents per pound:

	Red				White	
	Current		1 Year Ago		Current	1 Year Ago
	Dry	In Oil	Dry	In Oil	Dry and In Oil	Dry and In Oil
100-lb. keg	14.00	14.50	12.25	12.50	14.00	12.50
25 and 50-lb. kegs	14.25	14.75	12.50	12.75	14.25	12.75
12½-lb. keg	14.50	15.00	12.75	13.00	14.50	13.00
5-lb. cans			14.25	14.00	16.00	14.50
1-lb. cans			14.25	14.50	17.00	14.50

NEW *and* ENLARGED SHOPS

Consult the Buying Section when in need of machinery or supplies



WASHINGTON, D. C.

The Navy aims to give information regarding its purchases to all manufacturers known to be in a position to supply its demand. Owing to the need of prompt action in the cases of all machine tools hereinafter listed, the Navy cannot arrange to permit a postponement of the opening of bids if the manufacturers are able to secure bidding forms and submit their bids prior to date fixed for opening.

In case time does not permit this, it will be appreciated if any manufacturer not receiving information directly regarding these purchases will notify the Purchasing Division, Bureau of Supplies & Accounts, Navy Department, Washington, D. C., in order that the firm's name may be properly listed for all future purchases.

The Bureau of Supplies and Accounts, Navy Department, will soon receive bids furnishing machines and machine tools as follows:

Schedule No. 3590—hacksaw blades, delivery various eastern and western yards.

Schedule No. 3591—hacksaw frame, delivery various eastern and western yards.

Schedule No. 7486½—bench lathes, delivery Alexandria, Va.

Schedule No. 7496½—1 bolt threading machine, delivery Charleston, S. C.

Schedule No. 7501½—1 hand planer and jointer, delivery Newport, R. I.,

Schedule No. 7502½—1 bench planer, delivery Newport, R. I.

Schedule No. 7505½—1500 drill drifts and miscellaneous drill chucks.

Schedule No. 7514½—bench lathes and equipment.

Schedule No. 7531½—slotter machine, delivery Washington, D. C.

Schedule No. 7536½—T. D. valve reseating outfits, steel sockets and tool holders.

Schedule No. 7542½—lapping machines, delivery Washington, D. C.

Schedule No. 7543½—slotting die machines, delivery Washington, D. C.

Schedule No. 7546½—engine lathe and equipment, delivery Newport, R. I.

Schedule No. 7548½—threading, cutting and pipe machines, delivery Washington, D. C.

METAL WORKING

NEW ENGLAND STATES

Conn., Hartford—H. Sodafsky, 16 Mahl Ave., has awarded the contract for a 66 x 110 ft. garage to be erected on Windsor St.

Me., Bath—Watson, Frye & Co., 19 Broad St., manufacturer of bronze castings and machinery for paper and pulp mills, plans to rebuild its plant which was destroyed by fire last spring. Loss, $75,000. Noted Apr. 25.

Mass., Boston—The Bureau of Yards and Docks, Navy Department, Washington, D. C., has had plans prepared for a galvanizing plant to be erected here. Estimated cost, $50,000.

MIDDLE ATLANTIC STATES

Md., Baltimore—The Spedden Shipbuilding Co., Boston St. and Kenwood Ave., has awarded the contract for rebuilding a portion of its shipbuilding plant which was recently destroyed by fire. Estimated cost, $55,000.

N. J., Bayonne—The Filmore Cox Corporation has acquired an 11-acre site on Newark Bay and 11th St., here, and plans to build a factory for the manufacture of a machine for bending pipe. M. Cronan, City Hall, Secy. and Treas.

N. Y., Buffalo—The German Rock Asphalt Co., 1104 Morgan Bldg., has had plans prepared for rebuilding its manufacturing plant on Kensington Ave. and New York Central Belt Line, and also building a 2-story machine shop. C. Henderson, Supt.

N. Y., Malone—The Northern Garage Corporation, 18 Broadway, Saranac Lake, has had plans prepared by G. Schrader, Arch., Main St., Saranac Lake, for a 1-story, 50 x 160-ft. garage to be erected on Elm St. here. Estimated cost, $40,000.

N. Y., New York (Borough of Brooklyn)—The Circle Garage Co., 250 Coney Island Ave., plans to build a 1-story, 50 x 200 ft. garage on Coney Island Ave. and Prospect Park West. Estimated cost, $45,000.

N. Y., New York (Borough of Brooklyn)—The Dial Manufacturing Co., 40 Lexington Ave., has awarded the contract for the erection of a 2-story addition to its factory. Estimated cost, $8000.

N. Y., New York (Borough of Brooklyn)—V. Guardino, 39 Central Ave. has had plans prepared by C. P. Cannella, Arch., 1163 Herkimer St., for a 1-story, 25 x 100-ft. addition to his garage at 1925 Central Ave. Estimated cost, $15,000.

N. Y., New York (Borough of Brooklyn)—The Ideal Construction Co., 292 Rogers Ave., will build a 1-story, 100 x 100 ft. garage at 200-206 Emerson Pl. Estimated cost, $25,000.

N. Y., New York (Borough of Brooklyn)—The Pohl-Abbott Construction Co., 200 Montague St., will build a 1-story, 100 x 131 ft. garage on Ocean Ave. and Ave. N. Estimated cost, $35,000.

Penn., Erie—The Erie Crucible Steel Co. has awarded the contract for the erection of a 60 x 60 ft. and 76 x 100 ft. addition to its plant.

Penn., Forty Fort (Kingston, P. O.)—The International Fabricating Corporation, Wilkes-Barre, has had plans prepared for the erection of a 2-story, 50 x 160-ft. addition to its plant here. Estimated cost, $60,000.

Penn., Petroleum Center—The Pennsylvania Tank Car Co. plans to rebuild its plant which was recently destroyed by fire and will install modern machinery.

Penn., Pittsburgh—The Carbon Steel Co. 32nd St. and Allegheny Rd., has awarded the contract for the erection of three 1-story, 40 x 40 ft., 60 x 60 ft. and 80 x 80 ft. machine shops.

Penn., Rutherford—The Philadelphia & Reading R.R., Reading Terminal, Philadelphia, plans to build a machine shop and a boiler house, here. Estimated cost, $45,000. S. T. Wagner, Philadelphia, Ch. Engr.

Penn., Sharpsville—The Sharpsville Boiler Works, 6th St., recently increased its capital stock from $50,000 to $100,000 and is building 30 x 75 ft. and 50 x 75 ft. additions to its plant.

SOUTHERN STATES

Ky., Louisville—The H. Vogt Machine Co., 10th and Ormsby St., plans to install 2 or 3 traveling cranes in its shops.

Tenn., Chattanooga—The Casey-Hedges Boiler Co. plans to build an addition to its plant. Estimated cost, $20,000.

MIDDLE WEST

Ill., Chicago—The Acme Boiler & Tank Co., 1017 West 48th St., plans to build a 1-story, 52 x 85 ft. factory and machine shop. Estimated cost, $15,000. Westcott Engineering Co., 111 West Washington St., Consult. Engr.

Ill., Chicago—The Booth Fisheries Co., 22 West Monroe St., is in the market for a power belt-driven drill press, capacity 1½ in. through 2-in. steel.

Ill, Chicago—The Interstate Iron and Steel Co., 101 South Michigan Ave., is in the market for a continuous cutting or gap shear, for 16 ga. and lighter iron, foot power.

Ill., Chicago—The Victor Manufacturing & Gasket Co., 1956 South Troy St., plans to build a group of 1- and 2-story buildings on 12th St. and 58th Ave., for the manufacture of gas engine gaskets. Estimated cost, $250,000. A. S. Alschuler, 28 East Jackson St., Arch.

Mich., Detroit—The Board of Education, 50 Broadway, is in the market for the following machine tools with which to equip its machine shop and foundry in Cass Technical High School: 40 lathes, 3 shapers, 2 milling machines, 4 drill presses, 6 emery stands, 2 high-speed metal saws, 2 gas furnaces, 3 arbor presses, 2 tool post center grinders, 60 drills, milling cutters and complete equipment of machine tools, 1 to 8-in. belt lacing machine, cupola with blower, tumbling mill, pneumatic sand sifter, brass melting furnace with blower, 5 graphite crucibles and portable core oven.

Mich., Detroit—The Flower Stephens Manufacturing Co., Clayton and Parkinson St., has awarded the contract for the erection of a 1-story, 135 x 225 ft. foundry. Noted Dec. 12.

Mich., Detroit—The Michigan Smelting and Refining Co., 1685 Joseph Campau Ave., has had plans prepared by A. Kahn, Arch., Marquette Bldg., for a 2-story, 50 x 63 ft. cupola house, to be erected on Clay and Joseph Campau Ave. An ore hoist and tipple will be installed. Noted Dec. 5.

Ohio, Cleveland—The Dust Recovering and Conveying Co., 945 Engineers Bldg., has acquired the building at 1710-14 Woodland Ave., and plans to equip same for its own use.

Ohio, Dayton—The Burnett-Larsh Co., 127 East 3rd St., manufacturer of electric pumps and water systems, has acquired the 4-story factory of the Burkhardt Furniture Co., on Monument Ave. and Webster St., and will equip same for its own use.

Ohio, Warren—The Heltzel Steel Form and Iron Co. is in the market for a punch press with punching slot ⅜ x 18 in. for ½-in. soft steel.

Wis., Hartford—The International Steel Products Co., 1053 3rd St., Milwaukee, plans to build a 2-story, 66 x 116-ft. plant here. Estimated cost, $30,000.

Wis., Kaukauna—The Thilmany Pulp and Paper Co. plans to build a 2-story, 70 x 70 ft. addition to its machine, blacksmith and carpenter shop. Estimated cost, $50,000.

Wis., Milwaukee—The City Water Department plans to build a 1-story, 100 x 120 ft. meter repair shop on 3rd and Clinton St. Estimated cost, $60,000.

Wis., Milwaukee—The M. J. Walsh Machinery Co., 141 Syracuse St., is in the market for a number of lathes ranging in swing from 22-48, with 30 ft. bed or longer; 28 x 60 x 60 ft. planer with 2 or more heads; 5 ft. universal radial drill; slotter, 18-in. stroke, double head; 1¾ in. Landis bolt cutter and a 6 ft. boring mill.

Wis., Racine—The Perfex Radiators Co., 18th and Flett Ave., manufacturer of automobile radiators, has had plans prepared for the erection of a 2-story addition to its factory. Estimated cost, $100,000.

Wis., Racine—The E. C. Tecktonius Manufacturing Co., 1224 13th St., manufacturer of hardware specialties, plans to build a 2-story, 100 x 160 ft. addition to its plant with two 50 x 80 ft. wings. D. R. Davis, 526 Wisconsin St., Arch.

Wis., Watertown—O. Biefeld Co., 202 North Water St., will build a 66 x 124-ft. foundry next spring. Estimated cost, $75,000.

Wis., West Allis—F. M. Davis, 350 24th Ave. and J. T. Thompson, 1580 Stowell Pl., both of Milwaukee, plan to build a 1-story, 100 x 200 ft. factory here for the manufacture of milling and special machinery. Noted Sept. 26.

WEST OF THE MISSISSIPPI

Iowa, Cedar Falls—The Wagner Manufacturing Co. is in the market for a press similar to a Bliss No. 39, either with or without adjustable table.

Iowa, Gutenberg—The Farm Traction Works has awarded the contract for the erection of a factory. Estimated cost $15,000.

CONTRACT WORK

WANTED AND TO LET

Does the heading attract your attention? If so, you are undoubtedly interested—one way or the other; so are other readers of the American Machinist—many thousands of them.

The 24,000 copies of this issue go into an endless variety of manufacturing establishments placing orders for castings, stampings, screw machine products, special machinery, and all the other mass of contract work specialties.

To shops soliciting this work and to manufacturers placing it (with occasional capacity to take on work themselves) the

CONTRACT WORK

section—represents an ideal means of soliciting and placing orders.

Are You Interested?

Iowa, Iowa City—The O'Leary Auto Co., c/o J. O'Leary, is having plans prepared for the erection of a 1-story, 80 x 112-ft. garage.

Kan., Armourdale (Kansas City P. O.)—Wilson & Co., Osage and Adams St., Kansas City, Mo., has awarded the contract for the erection of a 3-story, 50 x 60 ft. machine shop.

Minn., Minneapolis—The Emerson Brantingham Co., South Independence Ave., Rockford, Ill., manufacturer of agricultural machinery, is building a 2-story, 60 x 100 ft. plant on University Ave., here. Noted Dec. 12.

Mo., St. Louis—The City and Chamber of Commerce plan to build hangars and machine shops for aerial mail service. P. Bunn, Secy., Chamber of Commerce.

Mo., St. Louis—D. O'Neil, 6481 Ellenwood Ave., has awarded the contract for a 1-story, 150 x 150 ft. motor service station to be erected at 203-7 South 14th St. Estimated cost, $50,000.

Mo., St. Louis—The Scullin Steel Co., 6700 Manchester Ave., plans to build a 1-story addition to its machine shop. Estimated cost, $12,000.

Tex., Fort Worth—The Gulf Well Machinery and Manufacturing Co., Dan Waggoner Bldg., plans to build a plant for the manufacture of oil well machinery. Plans include an 85 x 250-ft. machine shop, 80 x 160-ft. foundry, forge shop, power house, garages, etc. Estimated cost, $225,000.

Tex., Fort Worth—The Peden Iron and Steel Co. has had plans prepared for the erection of a plant on South Main St.

Tex., San Juan—F. E. Powell has awarded the contract for the erection of a 50 x 120 ft. garage. Estimated cost, $15,000. Noted July 11.

WESTERN STATES

Calif., Los Angeles—W. H. Jahns, 912 West Pico St., will build a 1-story, 80 x 100 ft. machine shop addition. Noted Dec. 12.

Calif., San Francisco—The American Express Co. has awarded the contract for a blacksmith shop to be erected on Hawthorne St. near Folsom St. Estimated cost, $10,000.

Wash., Puget Sound—The Bureau of Yards and Docks, Navy Department, Washington, D. C., plans to build a locomotive house and garage here. Estimated cost, $25,000.

CANADA

B. C., Vancouver—Fire recently destroyed the plant of the Morrison Steel and Wire Co., 831 Powell St. Loss, $150,000. F. W. Wilkinson is interested.

B. C., Victoria—The Victoria Machinery Depot, 343 Bay St., will build shipyards and machine shop. Estimated cost, $350,000.

N. B., St. John—The Canadian Avero Co. plans to build a factory next spring for the manufacture of aeroplanes, etc.

N. S., Halifax—The Canada Metal Co., 37 Fraser Ave., Toronto, Ont., plans to build a manufacturing plant here. Estimated cost, $50,000. W. G. Harris, Toronto, Ont., Pres.

Ont., Hamilton—The Talman Brass and Metal Co., Sanford Ave., has awarded the contract for the erection of a 1-story addition to its plant. Estimated cost, $5000.

Ont., Tilbury—O. J. Cavanaugh plans to build a foundry. Estimated cost, $10,000.

Ont., Toronto—J. M. Armstrong, 110 Mail Bldg., is in the market for the contents of a small machine shop or tool room.

Ont., Toronto—J. T. Hepburn Co., 12 Van Horn St., iron founders, plans to build an addition to its plant. Estimated cost, $12,000.

Que., Montreal—The Stinson-Reeb Builders' Supply Co., 45 St. Alexander St., is in the market for a jam crusher, capacity, 200 tons or more per 10 hours.

Que., Three Rivers—The Three Rivers Steel Foundry Co., Ltd., plans to build an addition to its plant and install additional machinery. Estimated cost, $40,000. A. B. Charlton, Mgr. and Engr.

GENERAL MANUFACTURING

NEW ENGLAND STATES

R. I., Providence—The Bourn Rubber Co., Warren St., has awarded the contract for a 20 x 60 x 90-ft. addition to its factory. Estimated cost, $20,000.

MIDDLE ATLANTIC STATES

Del., Wilmington—The Diamond Ice and Coal Co., 911 Market St., will build a 1-story, 100 x 150 ft. ice manufacturing plant on Pennsylvania and Grant Ave. Estimated cost, $30,000. Noted Dec. 5.

Md., Elkton—The Scott Fertilizer Co. plans to rebuild its plant which was recently destroyed by fire. Estimated cost, $250,000.

N. J., Newark—The Edison Lamp Works of the General Electric Co., Sussex St., Harrison, has acquired property on Frelinghuysen and Evergreen Ave. here and plans to build a plant.

N. J., Westfield—The Kling Furniture Co., Mayville, has had plans prepared for the erection of a 1-story, 64 x 500-ft. factory here. Estimated cost, $30,000. J. A. Kling, Pres.

N. Y., Buffalo—The Acheson Graphite Co. has awarded the contract for the erection of a 1-story, 40 x 40-ft. addition to its plant. Estimated cost, $15,000.

N. Y., Buffalo—The Prest-O-Lite Co., 720 Main St., has awarded the contract for a charging plant to consist of 4 buildings to be erected on Colgate Ave., Hopkins and Tifft St. Estimated cost, $75,000.

N. Y., New York (Borough of Brooklyn)—J. Bone & Sons, 614 Dean St., manufacturer of chemicals, is having plans prepared by W. H. Gompert, Arch., 171 Madison Ave., New York City, for a 3-story, 100 x 100 ft. factory to be erected on Carlton Ave. near Fulton St.

N. Y., New York (Borough of Richmond)—The Downey Shipbuilding Corporation, Richmond Terrace, will build a shipyard. Estimated cost, $1,000,000.

N. Y., Tarrytown—The Hudson Shipbuilding Corporation is building a new 1-story addition to its plant. Estimated cost, $20,000.

Penn., Bellefonte—Fire recently destroyed the plant of the American Lime and Stone Co. at Frankstown. Loss, $25,000. The company plans to build a new plant here.

Penn., Bridgeport—The Diamond State Fibre Co. is building a 1-story, 52 x 68 ft. and 20 x 75 ft. plant on Front St. Estimated cost, $25,000.

Penn., Mt. Holly Springs—The Mt. Holly Paper Co., c/o H. Maynard, Boston, Mass., has awarded the contract for the erection of a 1-story, 22 x 25-ft. addition to its factory here. Estimated cost, $5000.

Penn., Neville Island (McKees Rocks, P. O.)—The Rockgas Products Co., 345 4th Ave., Pittsburgh, has had plans prepared for a 1-story, 10 x 40 ft. refinery to be erected here. Estimated cost, $15,000. C. L. Kerr, Pres.

Penn., Philadelphia—J. and J. Dobson, 809 Chestnut St., manufacturer of carpets, blankets, yarn, etc., is building a 2-story factory. Estimated cost, $20,000.

Penn., Philadelphia—The Imperial Woolen Co., Main and Rector St., is improving and building an addition to its factory. Estimated cost, $35,000. Noted Dec. 12.

Penn., Pittsburgh—Armour & Co., 310 Anderson St., has had plans prepared for a 5-story packing plant and storage warehouse to be erected on Anderson and Lacock St.

SOUTHERN STATES

Fla., Okeelanta—The Okeelanta Stock Farms, Packing & Canning Co., 212 New Tatum Bldg., Miami, plans to build canning and dehydrating plants, near here. B. G. Cheek, Pres. and Gen. Mgr.

Ga., Americus—The Atlas Underwear Co., Piqua, Ohio, plans to build a yarn-spinning mill here.

Ky., Pineville—The Asher Stave and Lumber Co. plans to install machinery and equipment for cutting lumber and staves.

Ky., Torrent—The McCombs Oil Co., Inter Southern Bldg., Louisville, plans to establish a plant here, and will require coils, condensors, agitators, stills and general refining equipment. A. Renick, Pres.

Miss., Lyman—The Ingram-Day Lumber Co. plans to rebuild its sawmill and machine shops which were recently destroyed by fire. The company will install band, circular and gang saws, to have a daily capacity of 125,000 ft. Loss, $150,000. Noted Nov. 28.

Va., Broadway—The Mutual Cold-Storage Co. plans to repair its 70 x 70-ft. plant recently damaged by fire and build a 30 x 40-ft. mill and ice plant.

W. Va., Bluefield—The Bluefield Candy Co. has leased a building here and plans to equip same for its own use.

MIDDLE WEST

Ill., Chicago—L. F. Nonnast & Son, c/o Hart & Whetson, 5 North La Salle St., manufacturer of tables, will build a 1 and 3-story plant. Estimated cost, $7000. Mundie & Jensen, 39 South La Salle St., Arch.

Ill., Chicago—Wilson & Co., Union Stock Yards, plans to build a 2-story, 66 x 100-ft. addition to its canning factory on 44th St. and Southwest Blvd. Estimated cost, $60,000.

Ind., Evansville—The Evansville Packing Co., Morgan Ave., has awarded the contract for the erection of a 1-story, 35 x 53-ft. addition to its packing plant. Estimated cost, $10,000. Noted Dec. 12.

Ind., Hartford City—The Ft. Wayne Corrugated Paper Co., Murray and Barr St., Ft. Wayne, plans to build a 2-story addition to its factory here. Estimated cost, $75,000.

Ohio, Cleveland—The Ohio Bronze Powder Co., 1120 East 152d St., has awarded the contract for the erection of a 2-story, 56 x 70-ft. factory. Estimated cost, $18,000.

Ohio, Columbus—The Federal Glass Co., Innis Ave., is building a 3-story, 122 x 257 ft. factory for the manufacturing of paper boxes. Estimated cost, including equipment, $300,000.

Ohio, Youngstown—The Industrial Gas and Chemical Co., recently incorporated with $250,000 capital stock, plans to build a plant for the manufacture of welding gases, chemicals and dyestuffs.

Wis., Belleville—The Helvetia Condensed Milk Co. is building a 1-story, 115 x 165-ft. condensory. Estimated cost, $50,000. C. D. Baker, Mgr.

Wis., Milwaukee—The Milwaukee Paper Box Co., 400 Florida St., has had plans prepared for a 5-story, 120 x 144 ft. plant to be erected on Muskegon Ave. and South Pierce St. Estimated cost, $225,000.

Wis., Milwaukee—The Sterling Wheelbarrow Co., 64th and Pullen Ave., plans to build a 1- and 2-story, 125 x 300-ft. addition to its factory. Estimated cost, $60,000. Klug & Smith, Mack Blk., Engr.

WEST OF THE MISSISSIPPI

Iowa, Keokuk—The Gas Tank Recharging Co., 752 Pierce St., Milwaukee, Wis., is building a plant here for the manufacture of calcium carbide. Estimated cost, $500,000. Noted Oct. 24.

Mo., St. Louis—The Connelly Manufacturing Co., 210 North 7th St., manufacturer of stationery tags, jewelry boxes, etc., leased a building covering 10,000 sq.ft. floor space at 701 Lucas Ave. and will equip same for its own use.

Mo., St. Louis—The Stifels Union Brewing Co., Gravois and Michigan St., has awarded the contract remodeling a brewery into an oleomargarine factory. Estimated cost, $70,000. O. F. Stifel, Pres.

Okla., Tulsa—The Daniel Shoe Co., 417 South St. Francis Ave., Wichita, Kan., plans to build a new plant here.

Okla., Tulsa—The U. S. Compression Inner Tube Co., recently organized, plans to build a 50 x 300-ft. plant and install rubber machinery. M. C. Hale, Pres.

Tex., Fort Worth—The El Dorado Refining Co. plans to build an oil refinery, capacity 5000 barrels. Estimated cost, $1,000,000.

Tex., Fort Worth—The Evans Thwing Co. plans to build a refinery to have a capacity of 3500 bbls. Estimated cost, $600,000.

WESTERN STATES

Calif., Laverne (Mill Valley P. O.)—The Laverne Lemon and Orange Growers' Association has awarded the contract for the erection of a 1-story, 68 x 113 ft. packing house and a 1-story office. Estimated cost, $20,000.

Calif., San Diego—Musher & Co., 140 Liberty St., New York City, has authorised J. G. Buerkle, San Diego, to begin negotiations for the erection of a fish cannery and olive oil packing plant here. Estimated cost, $100,000.

CANADA

B. C., Point Grey—A. MacLeod, represented by J. F. Noble, 510 Hastings St., W., plans to build a sawmill. Estimated cost, $60,000.

Ont., Bridgeburg—The Canadian-Chicago Bridge and Iron Co. is negotiating for a 600 ft. waterfront site on the Niagara River, on which it plans to erect a shipbuilding plant and a dock.

Que., Clarke City—The Gulf Pulp and Paper Co. plans to build a paper mill. Estimated cost, $10,000. T. Clarke, Supt.

Que., Three Rivers—The Wabasso Cotton Co., St. Maurice St., plans to build an addition to its cotton mills. Estimated cost, $300,000. C. R. Whitehead, Mgr.

A Message for YOU

may be included in the Searchlight advertisements of this issue. They catalog the current needs and special opportunities of the machinery field.

Note the steel stock and small tools offered by a private owner; the opportunities for buying established shops; to acquire a Canadian factory. Note the opening for a Superintendent; the high-grade Works Manager looking for a new connection. The big variety of equipment wanted and for sale.

You may be passing up a real opportunity if you do not look over the Searchlight pages each week. Better start the habit NOW.

See pages 268 to 297

Volume 49, Number 26 December 26, 1918 *20 cents a copy*

American Machinist

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MASON BRITTON, *Manager*

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The Four-Dollar Days Are Slipping Swiftly By

As previously announced, the American Machinist is face to face with the necessity of increasing its subscription rate to $5

It's a necessity that is forced upon us by the pronounced upward tendency in the cost of paper, ink, engravings, labor, brains—everything that enters into the making of a great modern technical journal.

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For these are days when the machine-shop industry and all who serve it must go steadily forward. Days when nothing less than the very highest type of journalistic service will suffice for the expanding needs of the men who are to produce the machinery required in rehabilitating the war-worn world of today and in building up the vast new industrial world of tomorrow.

The American Machinist purposes to be more than ever a vigorous element of basic importance to the progress of the great industry which it serves.

It wishes to take you along with it as it blazes the trails ahead. Both of us will be the stronger by our traveling in each other's company. And to make it easy for you to keep step with the progress it will be continually unfolding, at the minimum of personal expense to you,

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SMALL TOOLS

77

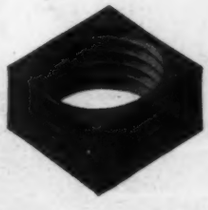
Two Tests That Show The Superiority of Pratt & Whitney Taps

This cut shows a Pratt & Whitney Taper Hand Tap, after being forced by power nearly through a nut in which the hole was purposely drilled considerably smaller than the root diameter of the tap. This, of course, left an excessive amount of work for the tap to do.

Yet owing to the design and construction of the tap (notably the cylindrical pilot with relieved chamber on the point, and the full relief given to the chamfered portion), there was no evidence of imperfect threading or any indication whatsoever of the hard usage to which the tool was put.

The Freest Cutting Taps for Tapping Nuts

To show more clearly the free cutting qualities of Pratt & Whitney taps a nut slightly smaller than one and one-quarter inches square was drilled for tapping and held lightly by the corners. The nut was then tapped with a 1¼ U.S.S. con-eccentric tap driven through without reversing.



So perfect were the cutting qualities and so easily and freely was the work done that this mere shell of a nut was not even distorted, to say nothing of being split as would have happened with a tap differently constructed.

Consider what this means to the nut manufacturer from the standpoint of a saving in power.

Our Catalogue "Small Tools" is waiting for your request

PRATT & WHITNEY CO.

GENERAL OFFICES, 111 BROADWAY, NEW YORK

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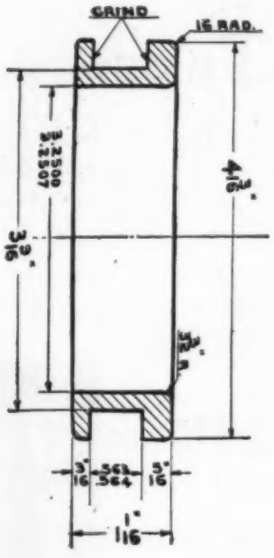
A JOB
and the Lodge & Shipley Manufacturing Lathe



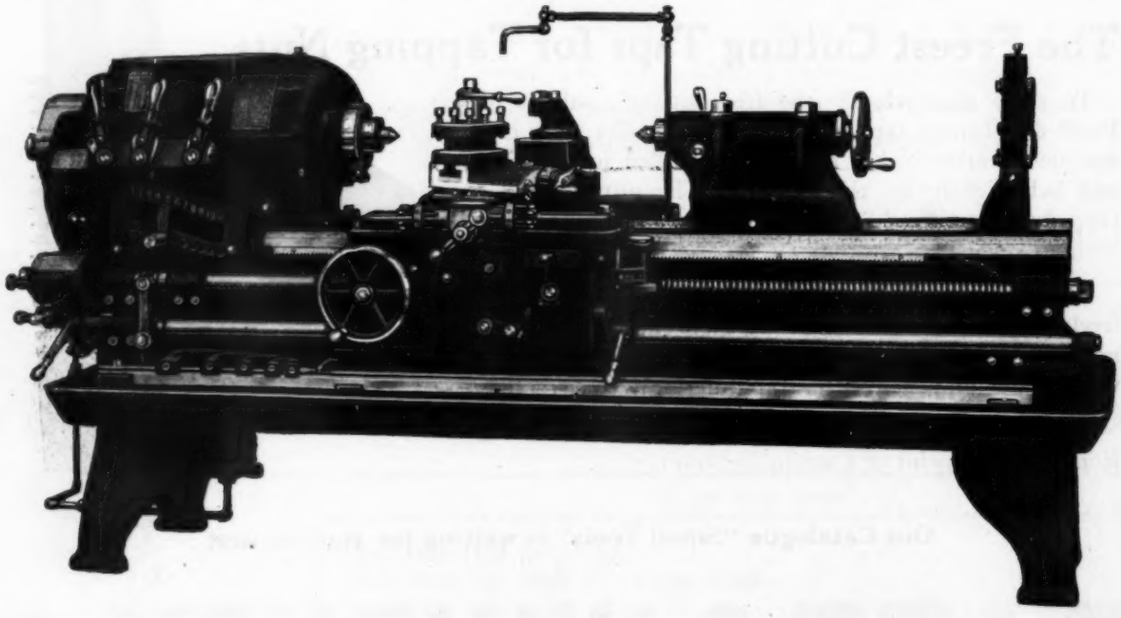
To machine complete with one setting of tools, the illustrated "Friction Spool" requires 15 minutes on the Lodge & Shipley Manufacturing Lathe.

The material is a 20 point carbon steel solid bar; 36 inches long.

The effected saving is 55 minutes on each piece and the reclaimed core of the bar.

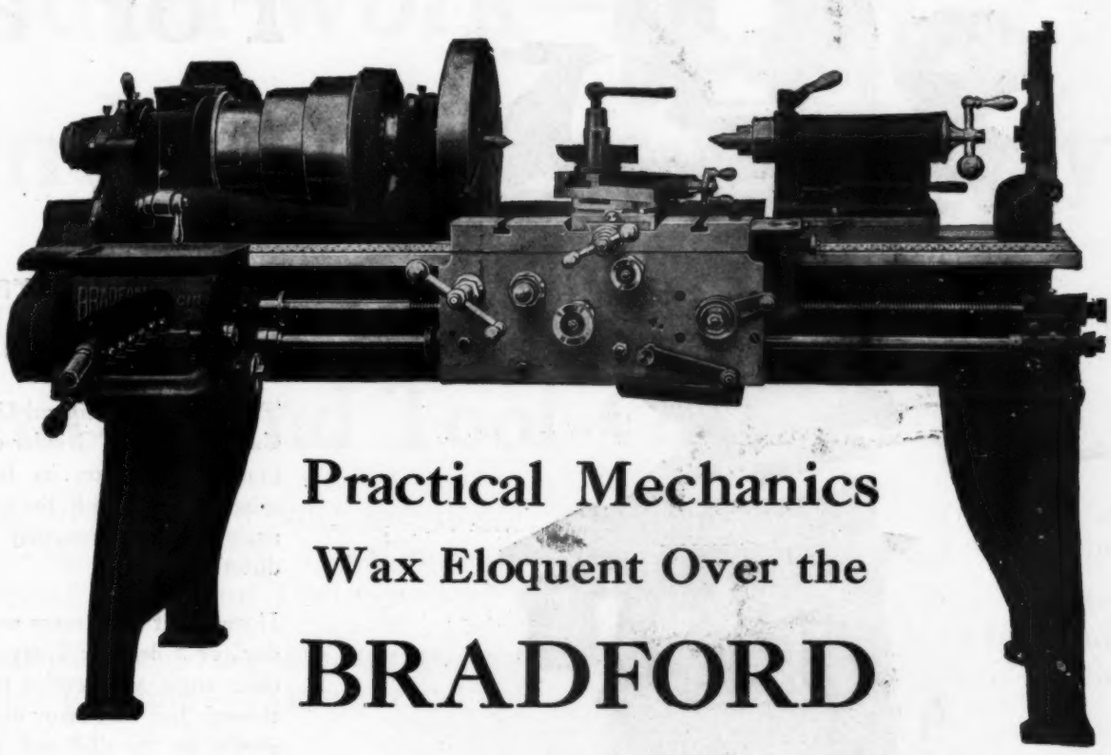
How many jobs of a similar nature have you in your shop? We are prepared to show the Lodge & Shipley Manufacturing Lathe, giving you a reduced production cost.

Send us your blueprint and description for estimates.



The Lodge & Shipley Machine Tool Co.

Cincinnati, Ohio, U. S. A.



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Naturally we appreciate the unstinted admiration of laymen over Bradford *appearance.* There is a certain *something,* an instinctive ability which permits him to "size up" the outward beauty of a good piece of machinery.

But what pleases Bradford builders most is the whole-souled commendation given their products by men reared in lathe-using—the practical mechanic who actually knows what a good lathe should be capable of doing.

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The practical mechanic's commendation is based on practical workaday features.

Our bulletins tell of the abundance of Bradford practical features. Write for them.

The Bradford Machine Tool Company

Cincinnati, Ohio, U. S. A.

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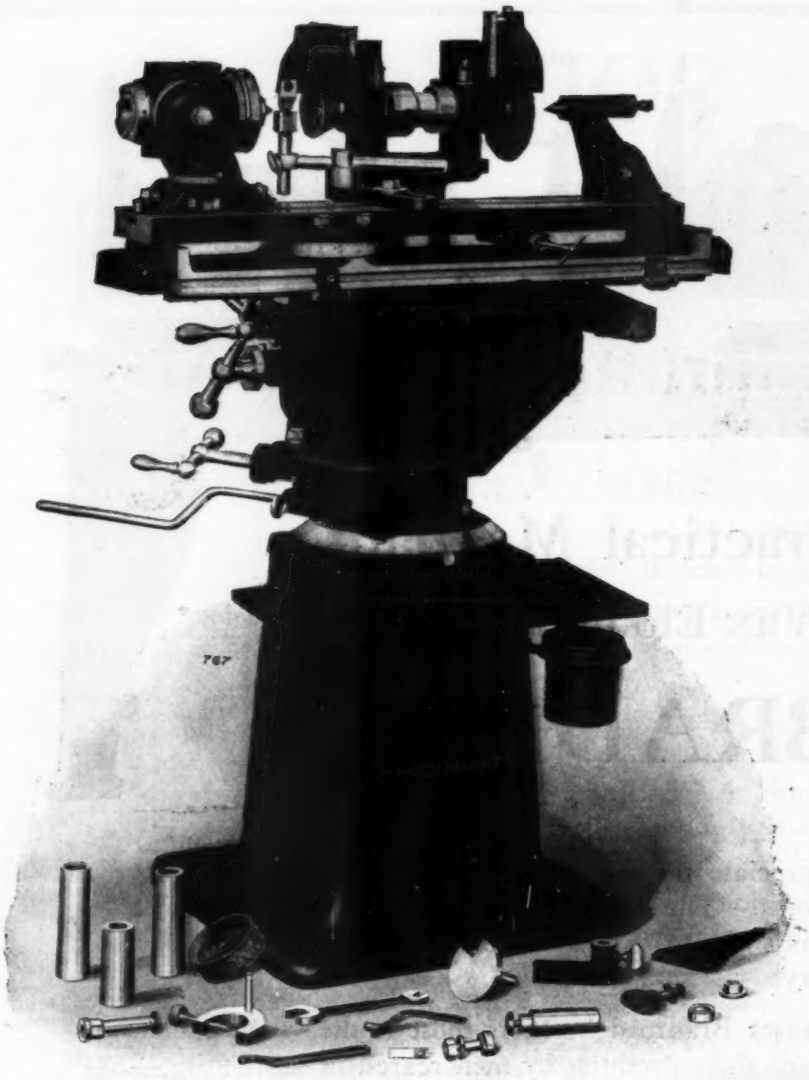

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Takes work 10-in. diameter, 17-in. long. Has 16-in. table travel—9½-in. cross and 7-in. vertical. Will grind High Power Face Mills up to 12 in. in diameter and Standard Face Mills up to 16-in. diameter; formed cutters up to 5½-in. diameter, using a 4-in. diameter grinding wheel.

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Correct clearance angle feature

The No. 1½ Cincinnati Universal Cutter and Tool Grinder carries a graduated dial on its headstock spindle from which the clearance angle for all cutters may be read direct.

If you want a clearance angle of 3 deg., or 5 deg., or 7 deg., or any other angle, you revolve the work through just that many degrees, as shown by the dial and set your tooth rest accordingly, and you can always duplicate the angle which has proved best.

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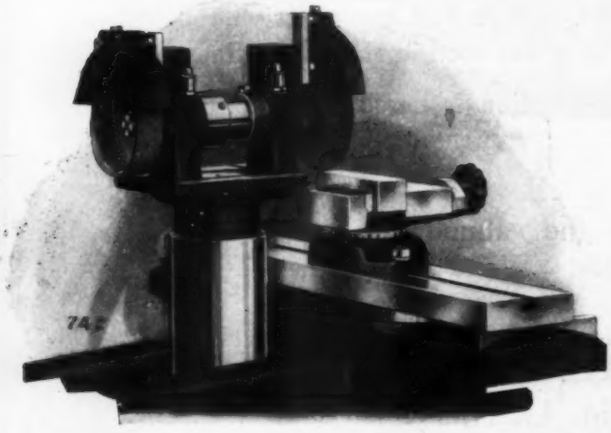

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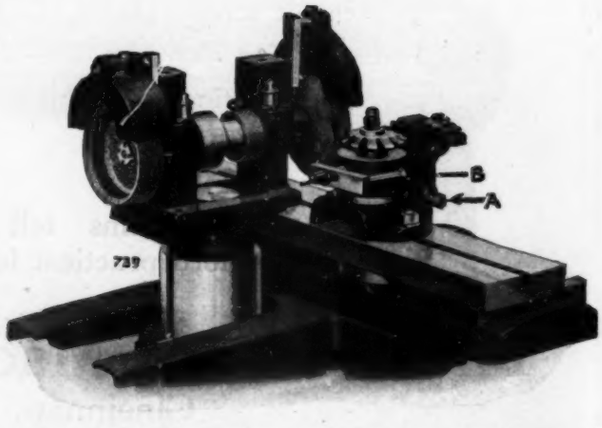

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around work—
grinding cutters properly—

No. 1½ Cincinnati Universal Cutter and Tool Grinder

Handy to have at all times and all seasons — that is the No. 1½ Cincinnati Universal Cutter and Tool Grinder.

Cylindrical, internal, face, surface and angular grinding — that expresses one phase of its activities.

The other is restoring your cutters to their original efficiency — not just regrinding them, mind you, but restoring the clearance angle so that the cutters cut as freely as they did originally.

The name "Universal" can most certainly be applied to this Cutter and Tool Grinder. It's a "First Aid" Machine in the Tool Room.

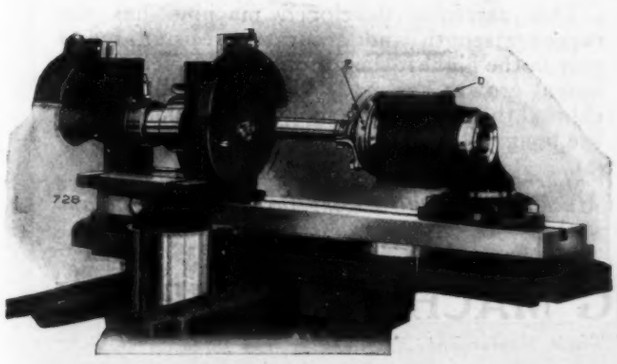
You'll find it useful in a hundred ways.

You'll find that any ten of that hundred will justify its installation in your tool room.

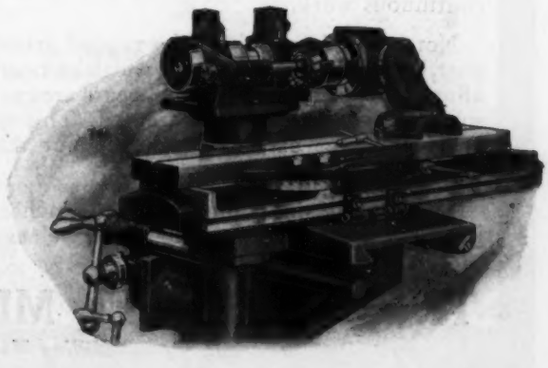
Ask for Bulletin describing the No. 1½ Cincinnati Universal Cutter and Tool Grinder

THE CINCINNATI MILLING MACHINE CO.

CINCINNATI, OHIO



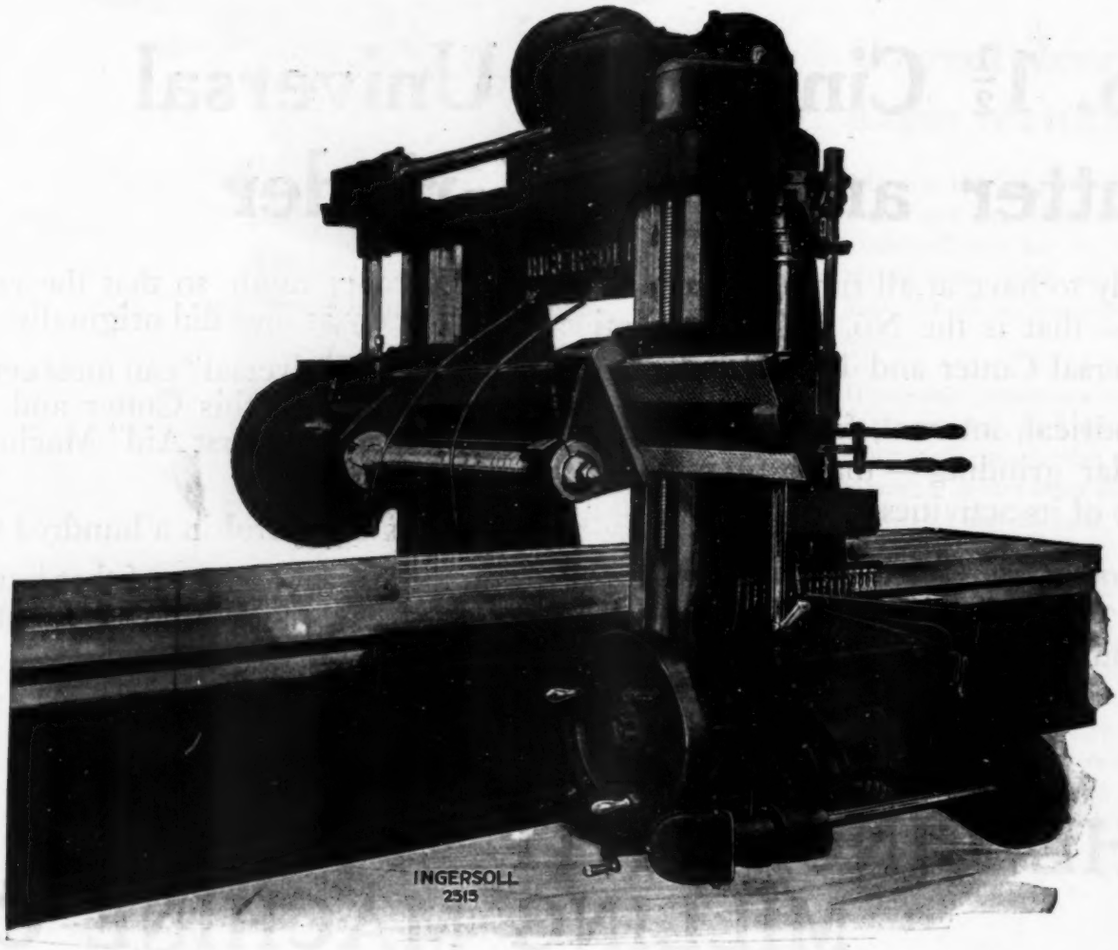
CYLINDRICAL GRINDING ATTACHMENT: Swings 17 in. between centers and grinds work 16 in. long.



INTERNAL GRINDING ATTACHMENT: Stem ⅝-in. diameter by 3 in. long. Grinds holes 3 in. deep, ¾-in. diameter and larger.

INGERSOLL

Horizontal Spindle Milling Machines



AN Ingersoll Horizontal Spindle Milling Machine has a great capacity for heavy, fast, continuous work.

Note the heavy arbor, the rugged arbor support, the size of rail and the width of bearing it affords the arbor support. All gears are cut from solid forgings and are heat-treated. This type of construction is carried on throughout the machine.

It is built in sizes ranging from 24 inches to 60 inches in width and from 8 to 20 feet in length. It is arranged for eight changes of spindle speed and twelve changes of table feed.

This carefully developed machine has the rugged strength and accurate precision found only in the highest class tools. Thirty years' consistent growth has made "Ingersoll Milling Machines" the standard in shops where quality tools are bought.

There are other types of Ingersoll Milling Machines—all built in the same rugged style and with the same finish.

THE INGERSOLL MILLING MACHINE COMPANY

Milling Machines and Their Equipment

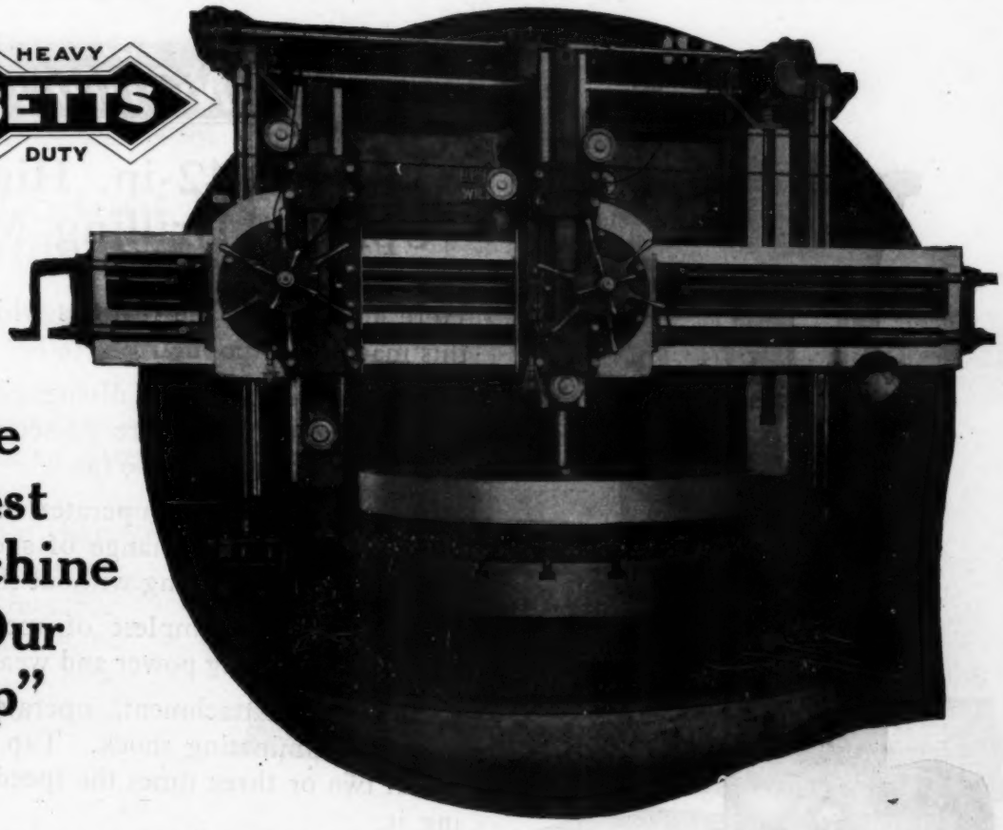
Main Office and Works: Rockford, Ill., U. S. A.

New York Office, 50 Church St., The Walter H. Foster Co., Mgrs. **Detroit Office, 1457 David Whitney Bldg., H. C. Rose, Mgr.**

BETTS

Heavy Duty Boring Mill

HEAVY BETTS DUTY



"The Finest Machine in Our Shop"

That was the manager's verdict after this Betts Boring Mill had been put into service —and he wasn't talking about its looks either.

He meant "finest" accuracy in the machine itself and the work it turned out; "finest" in point of output; "finest" when operating conveniences were considered. And this man knows Boring Mills. He is running a big gear making plant, and he has used and is using many machines of many kinds. We value his opinion.

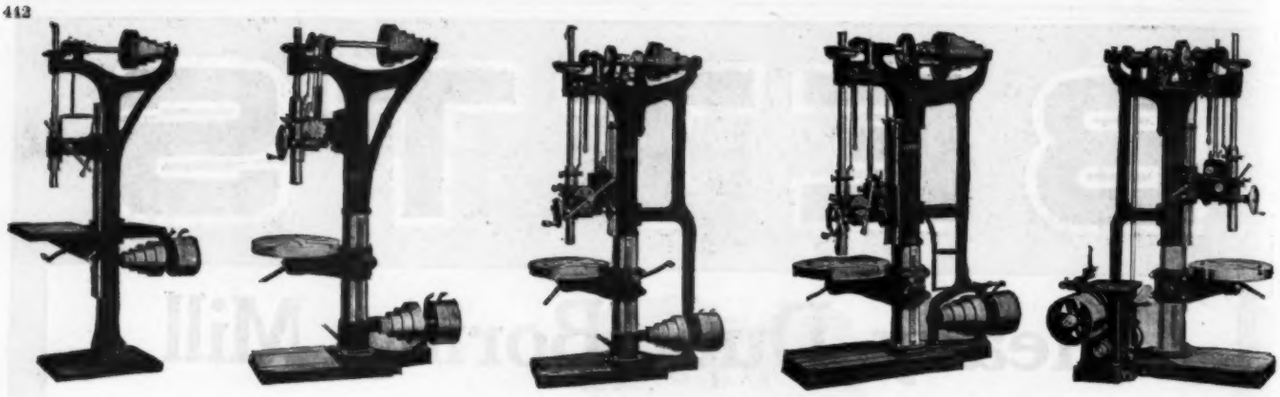
The photograph was snapped just as the machine was finishing a 76 in. diameter gear blank. The face of this blank was 6 in. Material, steel. The chips at the side of the table show the character of the cut being taken.

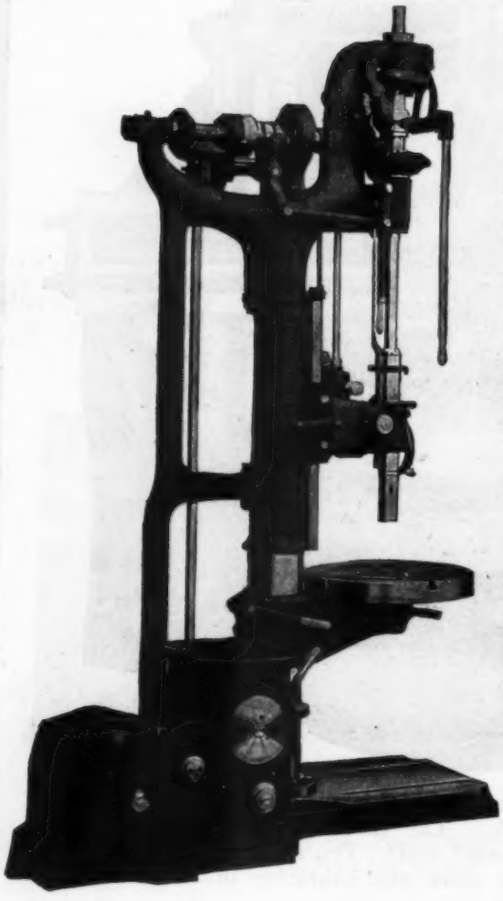
We'll be pleased to send more details of this 7 ft. Boring and Turning Mill—or any of our smaller or larger machines of this type.

We'd like also to have you see some of these machines in operation and to have you question their operators and owners. We'll send a list of installations in your neighborhood. Write us.

BETTS MACHINE CO.
402 Blossom Rd. Rochester, N.Y.
Formerly of WILMINGTON, DEL.

412





THE CINCINNATI

24-in. to 42-in. High-Speed Upright Drilling Machine

Here are some of the features which have made this machine so popular:

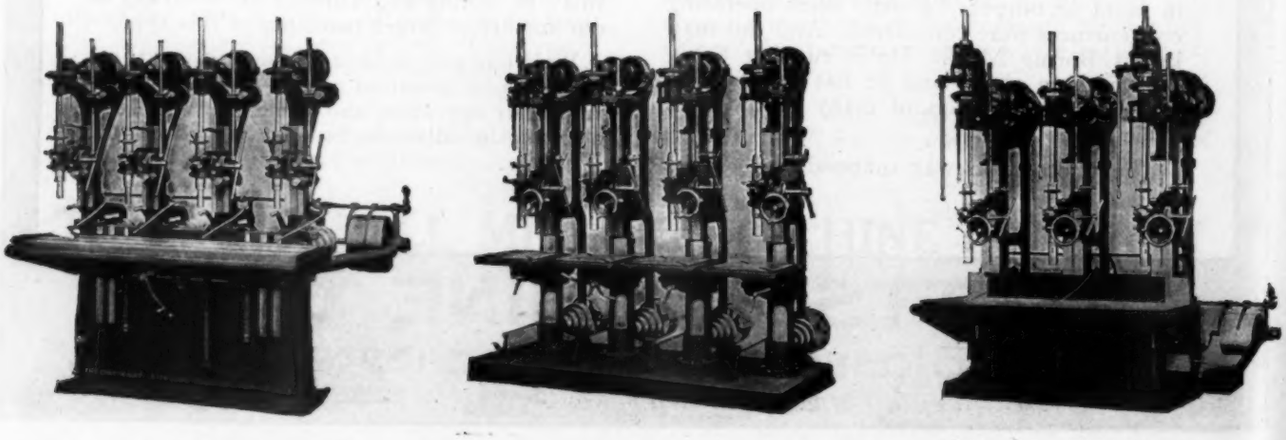
An Automatic Trip for disengaging the feed at any desired depth, a sure protection against the spindle being advanced too far—

A Back Gear, which operates through friction clutches, permitting change of speed while running, the gears engaging without shock—

A Shaft Drive, simplest of means for power transmission, saving power and wear on bearings—

A Tapping Attachment, operated by friction clutches, eliminating shock. Tap can be backed out at two or three times the speed used in entering it.

The Cincinnati Bickford Tool Co.
Oakley, Cincinnati, Ohio, U. S. A.
Founded 1874



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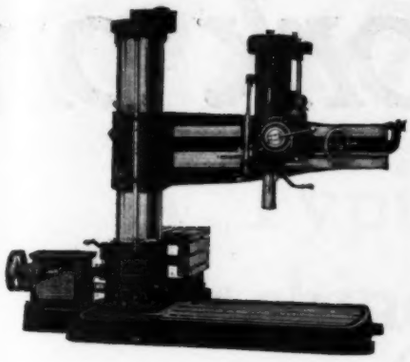
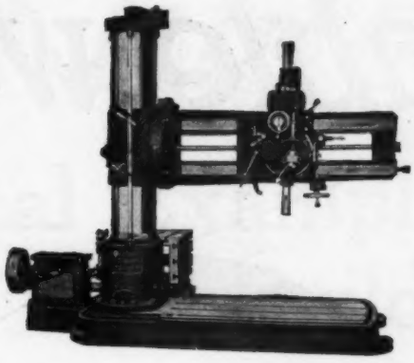
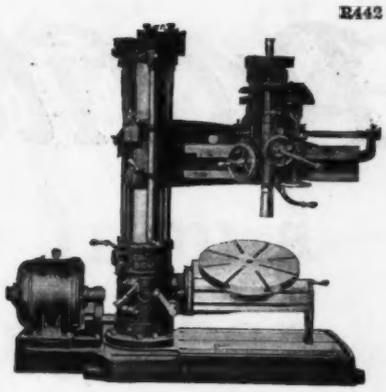




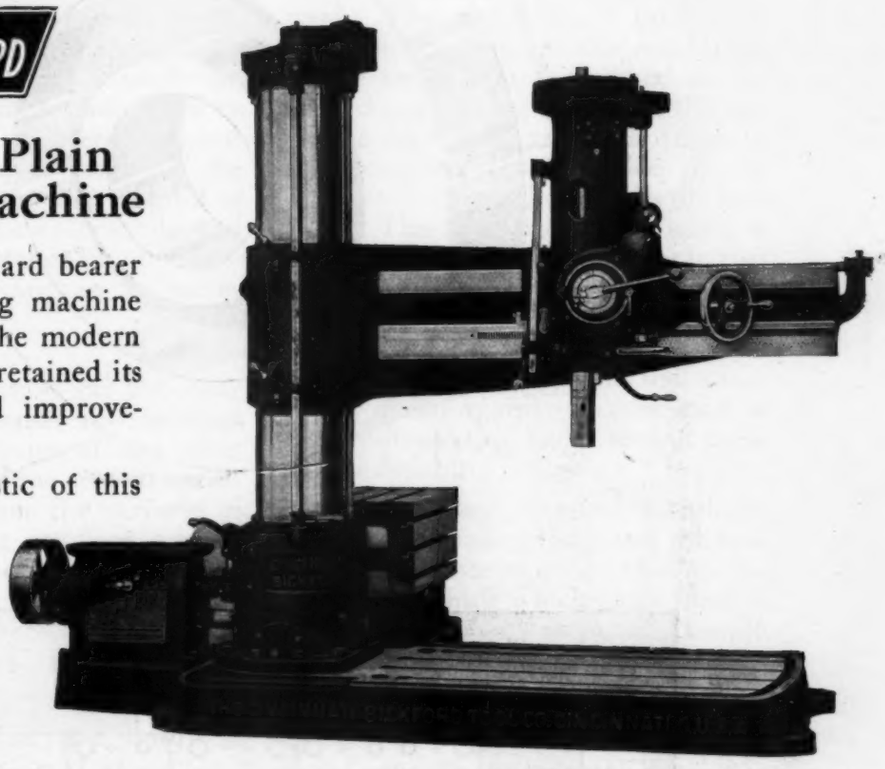


THE CINCINNATI BICKFORD

4, 5, and 6-foot Plain Radial Drilling Machine

This machine is truly a standard bearer of progress in radial drilling machine design. It was the first of the modern type of radials and has easily retained its lead with scores of patented improvements.

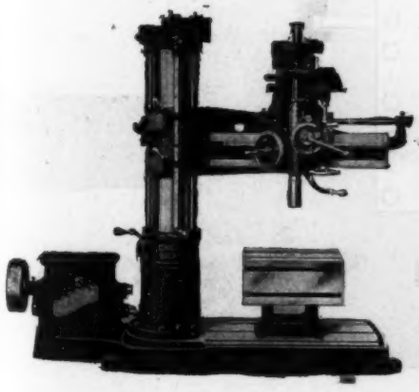
A most valuable characteristic of this radial is its various accident - proof features, which remove much of the costly danger of handling by inexperienced operators.

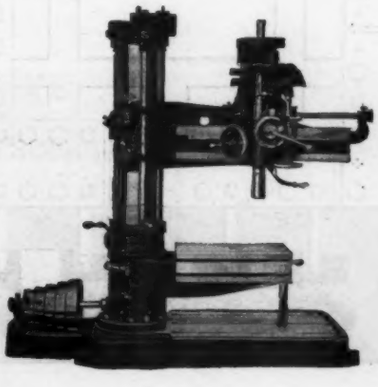


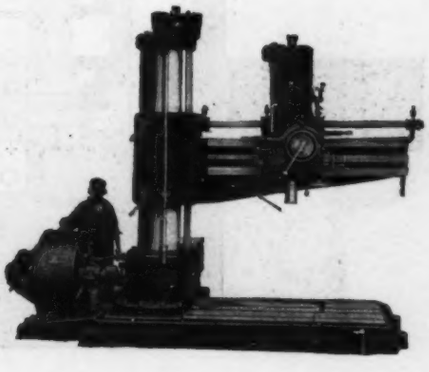
The Cincinnati Bickford Tool Company

Oakley, Cincinnati, Ohio, U. S. A.

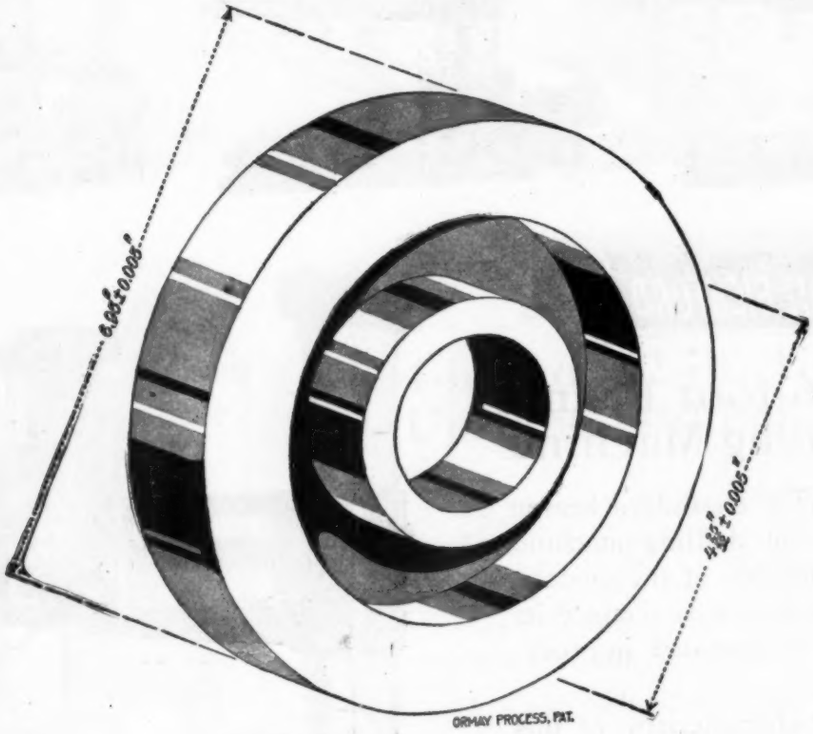
Founded 1874

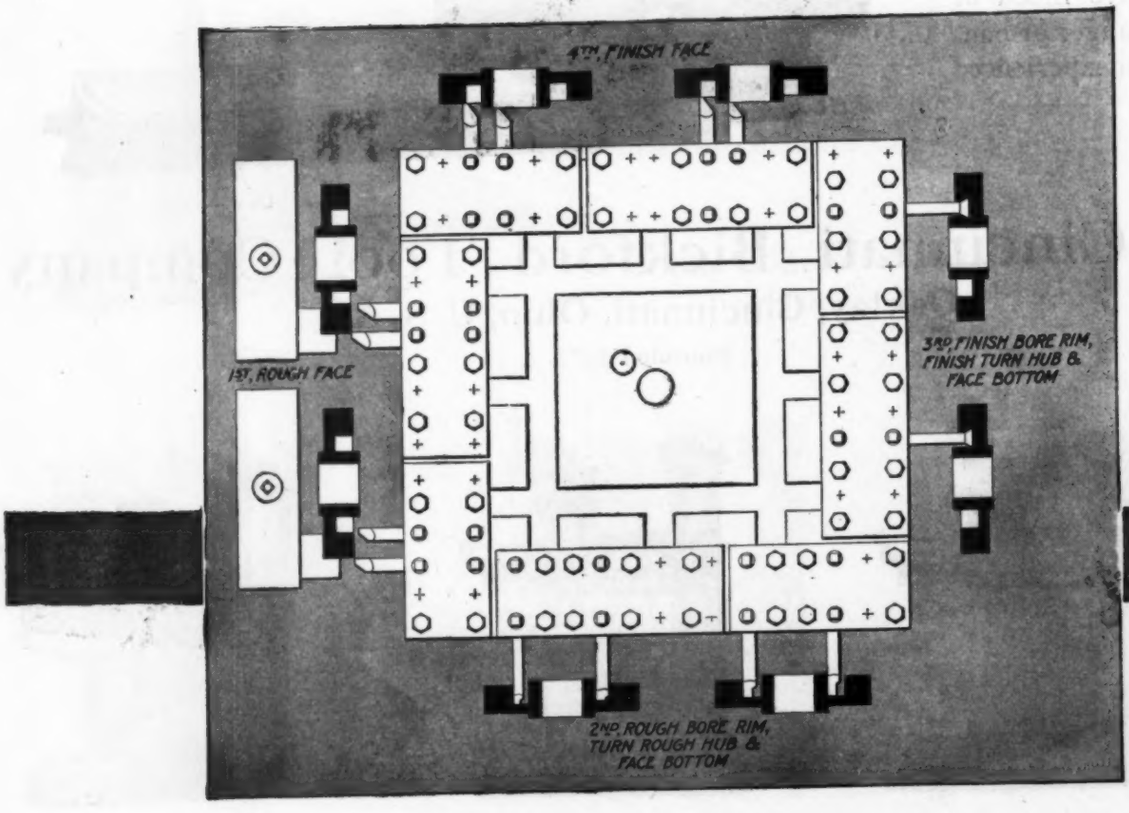






Profitable work on t




4TH, FINISH FACE
1ST, ROUGH FACE
3RD, FINISH BORE RIM, FINISH TURN HUB & FACE BOTTOM
2ND, ROUGH BORE RIM, TURN ROUGH HUB & FACE BOTTOM

the Flat Turret Lathe

A Typical Example from a Machine Tool Building Shop

The examples of work shown on these pages every week are largely of the kind met with in machine tool practice. This selection was made because it has sometimes seemed to us that machine tool builders have not understood the possibilities of the modern turret lathe quite so fully as their brethren in the automobile and allied fields. This series of advertisements looks forward to a better acquaintance.

In the first operation on the gear blank shown herewith the recessed face is finished, leaving all the other cuts to be taken in the second operation. By this means the surfaces in which accuracy is required are all finished at the same setting. The two operations are, however, kept very true with each other by holding the work in "soft jaws" for the second operation, as will be described next week. The main item of interest in the first operation is the machining of the recess. It is roughed in the second position by two tools, the one on the back side turned bottom up and roughing the rim side of the recess, while the other roughs the hub side. This is better than using a single tool, as it divides the cut in two chips, which roll clear of the recess without clogging. The finish turning and bottoming is done by a single tool in position three. This tool alternately feeds against a cross stop, a longitudinal stop, and a second cross stop in finishing the recess.

Notice the very practical usefulness of the cross sliding head and the system of positive stops in this operation. A machine which lacks them is badly handicapped even on a simple job like this.

When you are ready to consult us regarding the application of the Flat Turret Lathe to your work, a word from you insures our hearty cooperation.

JONES & LAMSON MACHINE COMPANY

Springfield, Vt., U. S. A. and 109 Queen Victoria Street, London, E. C.

France, Spain & Belgium: F. Auberty & Co., 91 Rue de Maubeuge, Paris;
Holland: Spliethoff, Beeuwkes & Co., Rotterdam

AMERICAN

Radials Mean Lower Cost Per Hole

That's what drilling resolves itself into anyway—the cost per hole.

American Radial Drills cost less per hole at all times because of their power, convenience and simplicity. They cost less in the long run also because of their high grade construction, and consequently low upkeep and long life.

Convenience of operation is a characteristic and outstanding feature of American Radials. All levers, hand knobs and controlling members are conveniently located.

Other features of great practical value are high initial driving power, direct transmission, elimination of loose running gears, low periphery speeds of gears, bronze journals and an efficient oiling system. Greater back gear ratios are afforded in American Radials than in any other standard make of radial drill.

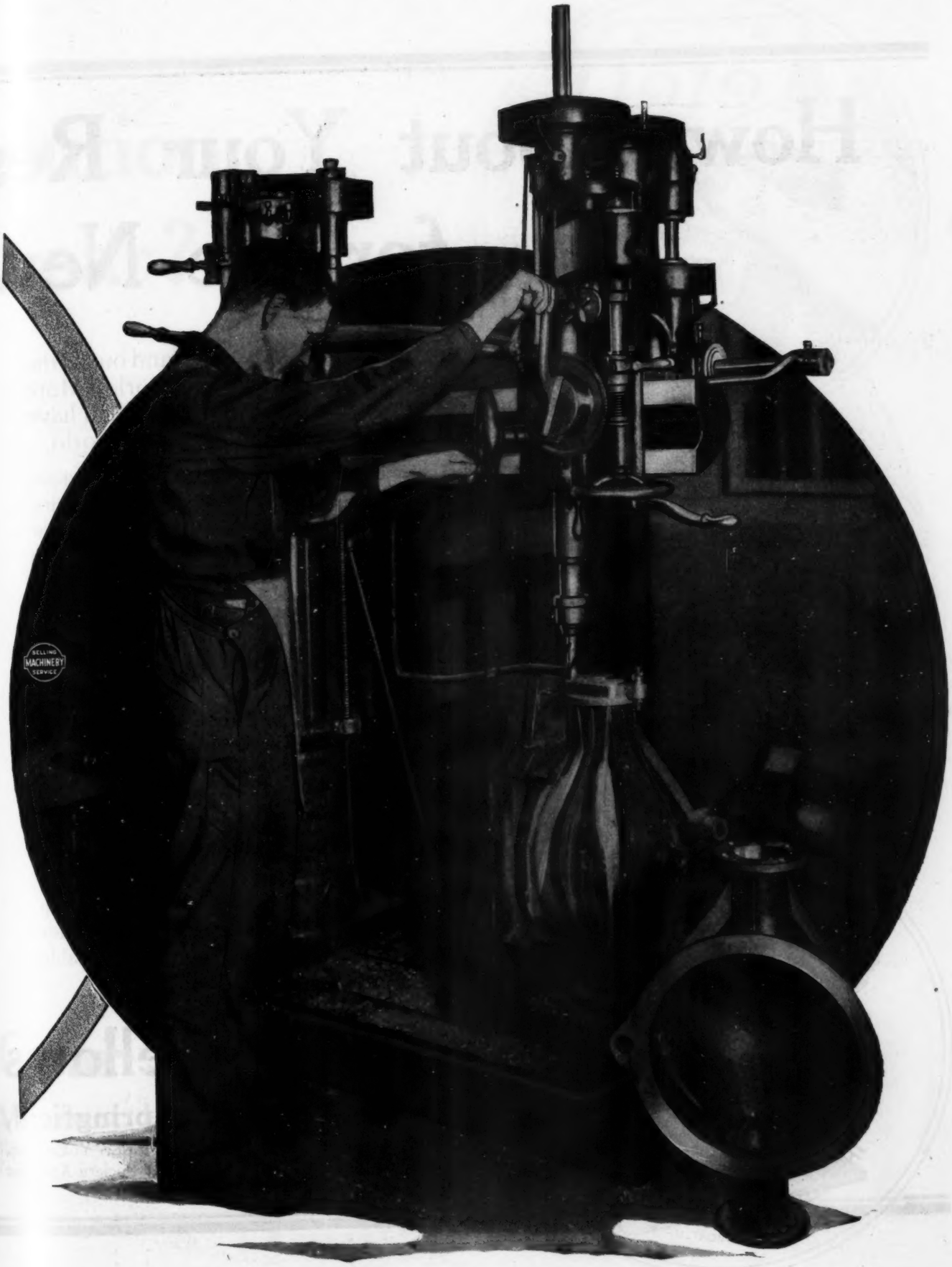
The Pierce-Arrow Company of Buffalo is finding satisfaction in drilling cast steel differential casings, as shown in the photograph. The work is clamped on an indexing fixture and four 37/64 inch holes are drilled in each end, through the ½-inch flange. The holes are then chamfered. Production is six complete casings per hour.

Production men, foremen and superintendents should write for a copy of our "Efficiency Bulletin." You will find it very interesting.

The American Tool Works Co.

Cincinnati, U. S. A.

Lathes Planers Shapers Radials


SELLING
MACHINERY
SERVICE

How About Your Res for the New

The past four years, 1914-1918, will stand out as the most important ones in the history of the world. More changes have taken place in these four years than have ever been recorded before in the history of the world.

But, the future starting with 1919 will, we believe, eclipse that of the four preceding years in important developments. We look for a development not only in democracy and popular government throughout the world, but a development in manufacturing methods that will have no parallel in history.

Nations that have been satisfied with slow, tedious, hand methods of manufacture have, within the past few years, become acquainted with the most modern methods of manufacture, and it is reasonable to believe that these will be improved upon in the near future. Not only will there be a great increase in the development of automatic machinery, but the so-called standard machine tools will be greatly improved.

It is the wise manufacturer who is preparing to put his plant on a peacefooting again and is looking around for the latest developments in machine shop processes and equipment. The war through which we have passed has certainly speeded up industryto an enormous extent and this speedingup has brought about remarkable

The Fellows

Springfield,

Foreign Agents: Alfred Herbert, Ltd., Yokohama, and Societa Anonima

olution Year?

changes. Conditions that existed prior to the war can never exist again.

Thousands of shops throughout the country and throughout the world, in fact, have become acquainted with and are using limit gages for inspection purposes. Improvements in gaging methods inevitably mean improvements in manufacturing methods. Therefore, the best equipment will be none too good to meet the exacting requirements.

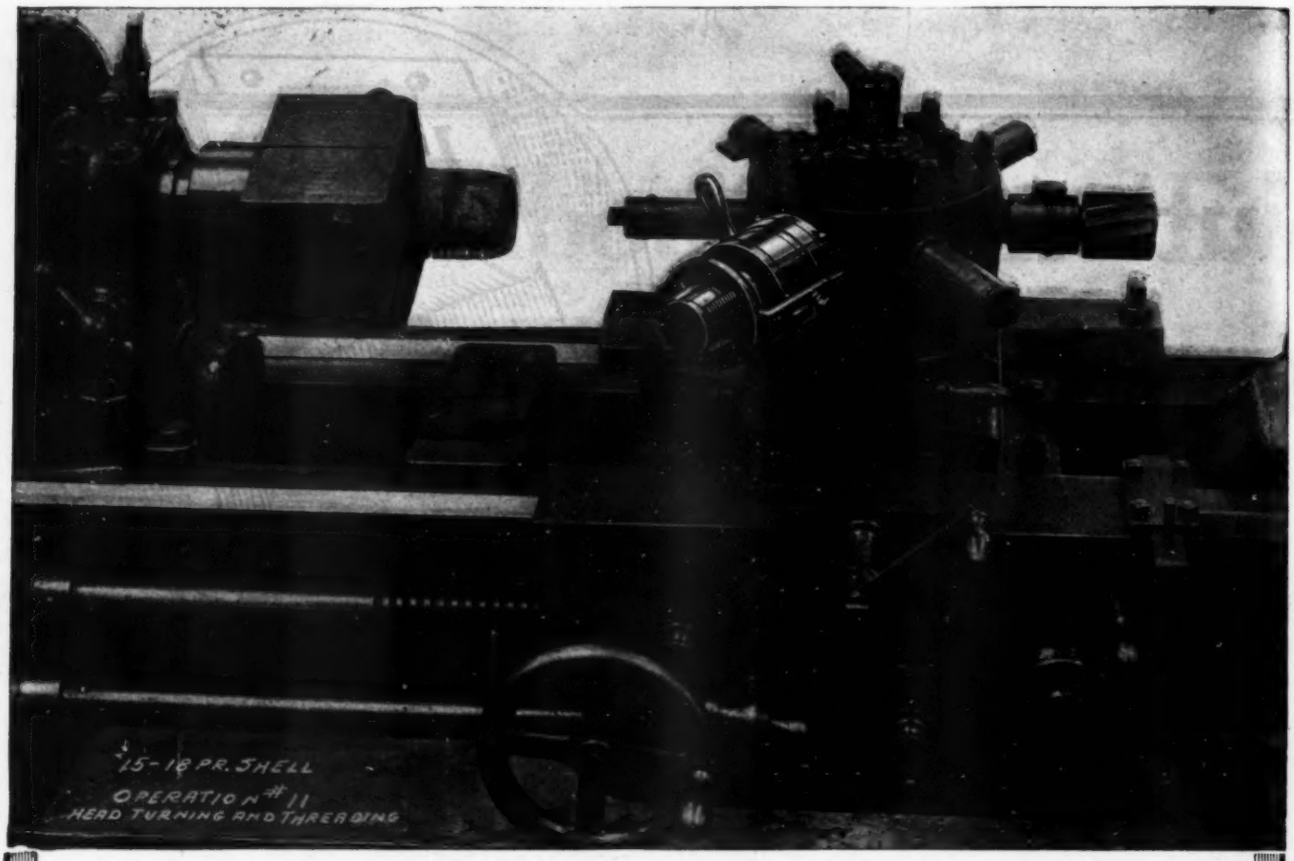
Gearing plays such an important part in all machinery, that the manufacturer who overlooks this vital point will not be able to keep step with more advanced methods. The Fellows Gear Shaper method of generating gears represents the most advanced method in the progress of gear cutting. As an example of economy in manufacture, the change gear box of a geared lathe can be greatly simplified and improved by using one-piece cluster gears instead of a group of individual gears keyed together. We could cite many other examples, but space will not permit.

If you are interested in the latest developments in gear cutting, a request from you will place our valuable literature in your hands, which can be studied with profit.

Gear Shaper Company

Vermont, U. S. A.

Japan; Calcutta, India; Coventry, England; Societe Anonyme Alfred Herbert, Paris, France and Spain Italiana Alfred Herbert, Milan, Italy.



The Installation of a Geometric Collapsing Tap Stopped Rejections

At the start of this war, the machine shops of Canada were suddenly called upon to manufacture shells in huge quantities. They were, of course, unprepared, material and labor were frequently unsatisfactory, new methods and systems were in course of development, and rejections, due to poor threads, were very heavy.

A Geometric Collapsing Tap was applied to the cross slide on the carriage of this engine lathe and rejections, so far as this shop was concerned, stopped at once—this was four months after the war started and Geometric Collapsing Taps and Die Heads, in spite of adverse conditions, made it possible to carry large contracts to successful conclusions.

Every man who ever cut a thread should have the Geometric Catalog and should be on our mailing list of "Threads," issued monthly—they are both free, just write.

THE GEOMETRIC TOOL COMPANY

NEW HAVEN, CONN., U. S. A.

Chicago Office: 627 West Washington Boulevard

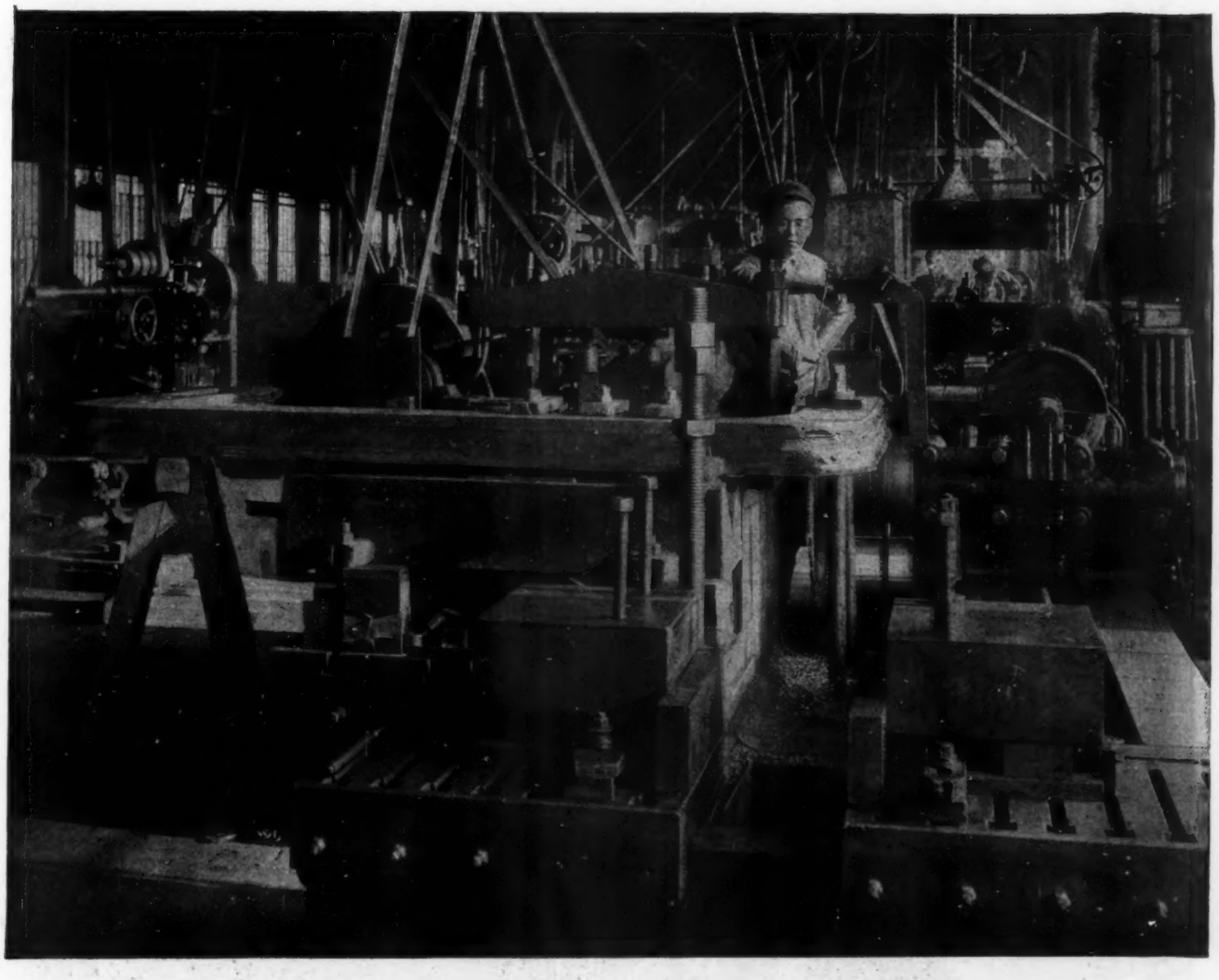
Regular Agents: The Chas. A. Strelinger Co., Detroit, Mich.; Hill, Clarke & Co., Boston; Vandyck-Churchill Co., New York and Philadelphia; Brown & Zortman Machinery Co., Pittsburgh, Penn.; The E. A. Kinsey Co., Cincinnati, Ohio; Strong, Carlisle & Hammond Co., Cleveland, Ohio.

Pacific Coast: General Machinery & Supply Co., San Francisco, Cal.; Smith-Booth-Usher Co., Los Angeles.

Canada: The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg and St. Johns, N. B.; Williams & Wilson, Ltd., Montreal.

Foreign: Chas. Churchill & Co., Ltd., London, Birmingham, Manchester, Glasgow; V. Lowener's Maskinforretning, Sverre Mohn, Norway; Bevan & Edwards Pty., Ltd., Melbourne, and White & Rae, Sydney, Australia. E. Isbecque & Co., Antwerp and Brussels, Belgium.

Also all Manufacturers of Screw Machines and Turret Lathes.



Where a "NEWTON" Cold Saw Saves Expensive Machine Work

Forged guide yokes cannot be finished close to shape. This leaves a large amount of surplus stock to be removed. "NEWTON" COLD METAL SAWING MACHINES make short work of jobs of this nature.

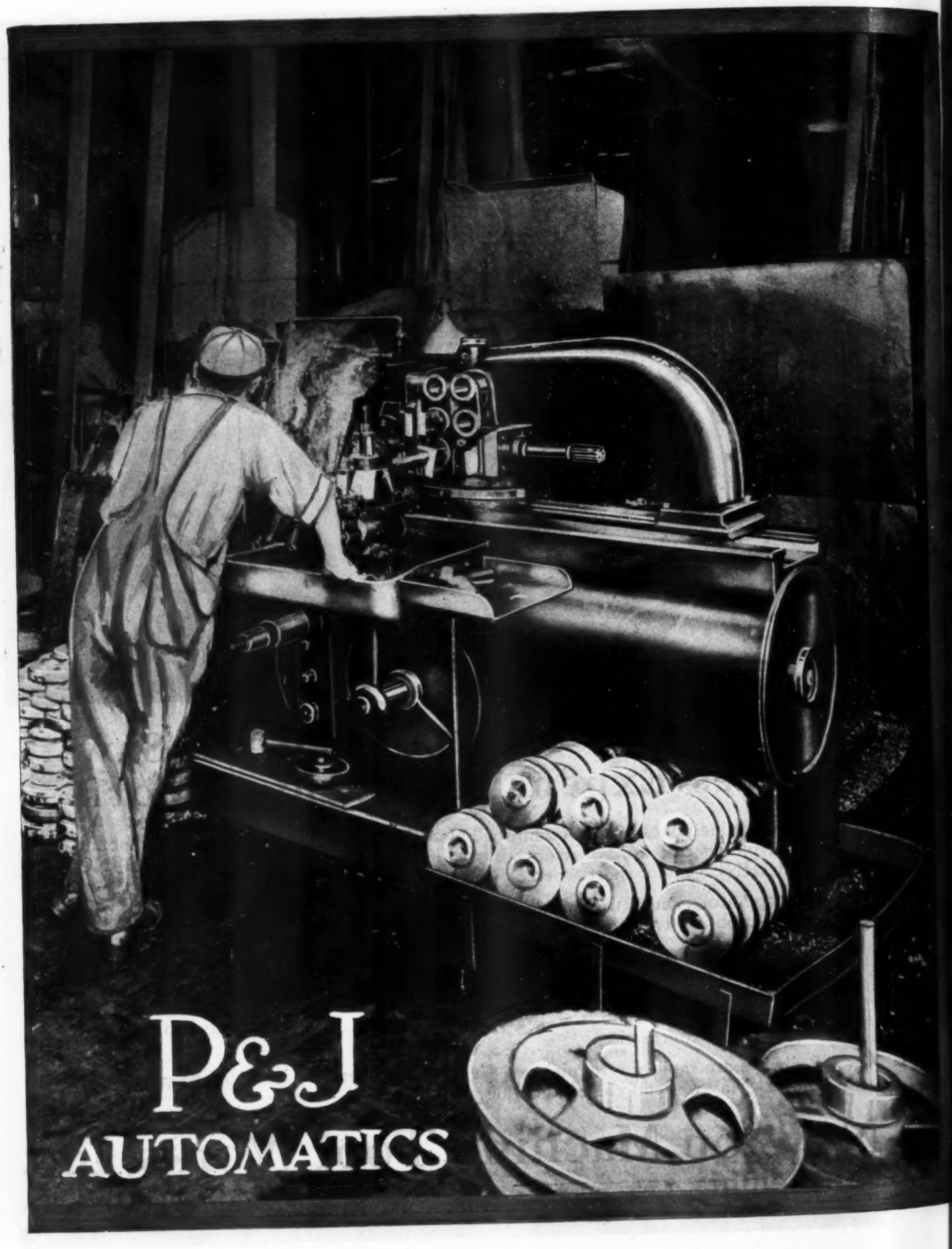
One operator clamps the job on the machine and starts the saw to cutting. The finished job is a true and smooth surface—no other machine work required.

There are dozens of jobs in your shop for which this machine is especially adaptable. With one Newton Cold Metal Sawing Machine, you save wasted time waiting for heats—extra stock is removed cold quicker with one operator than when heated—the finished job is accurate, no guesswork. You do not have to figure on expansion or contraction.

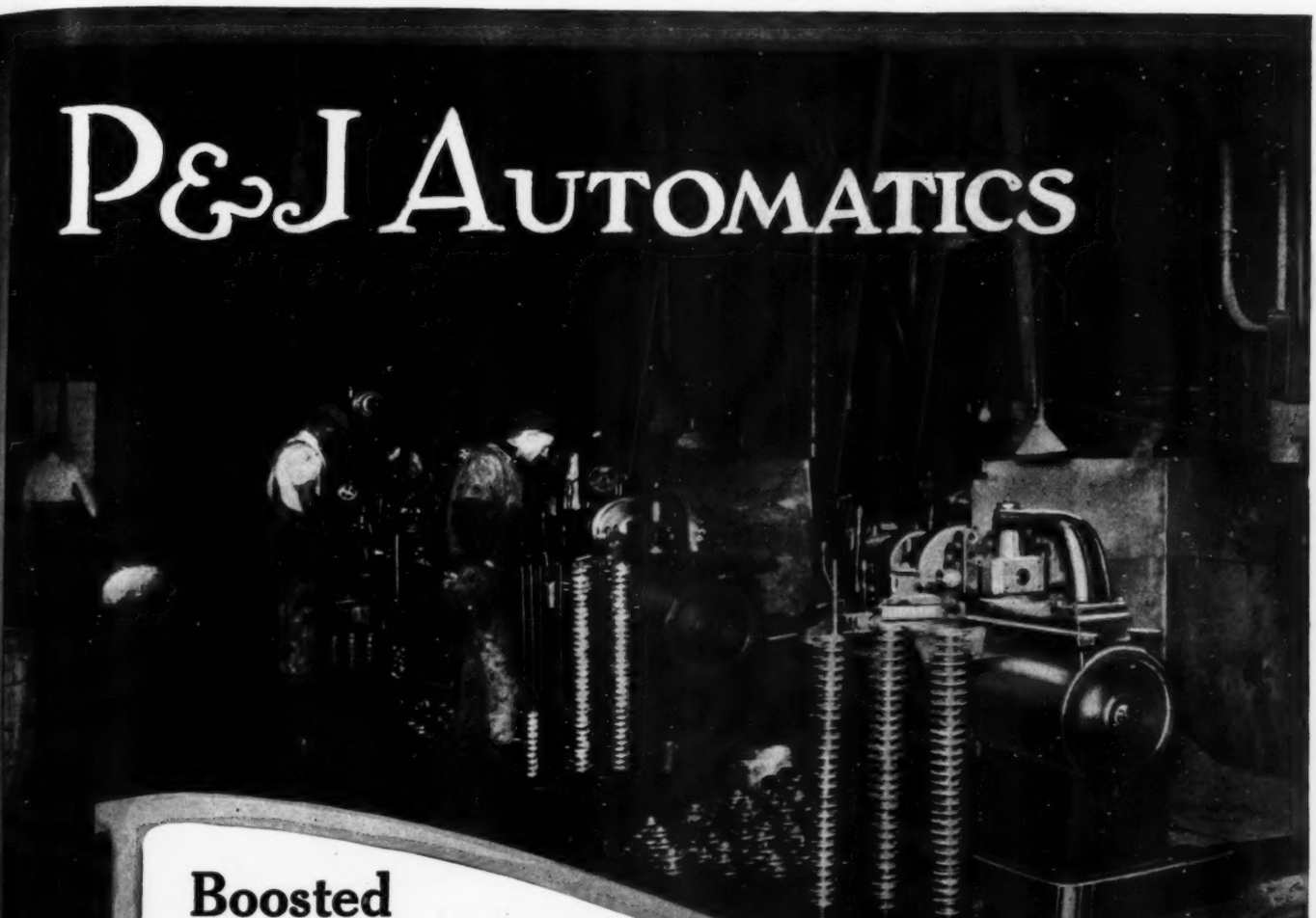
Railways are rapidly recognizing the value of "Newton" Cold Metal Sawing Machines. May we send you our catalog?

Newton Machine Tool Works, Inc.

Philadelphia, U. S. A.


P&J
AUTOMATICS

P&J AUTOMATICS



Boosted this Production 300 Per Cent.

No wonder the Albaugh-Dover Co., Chicago, "cannot say too much for the P & J!"

No wonder they order more as their business grows! And no wonder their business GROWS!

Former output was 36 bevel gears per nine hour day. Now one P & J turns out 150 gears every day. Drilling, boring, reaming, facing and turning are the operations.

And don't lose sight of the fact that one operator can run two to six P & J's at the same time. PROFITABLE PRODUCTION—that's what the P & J means.

Send us your blue prints.

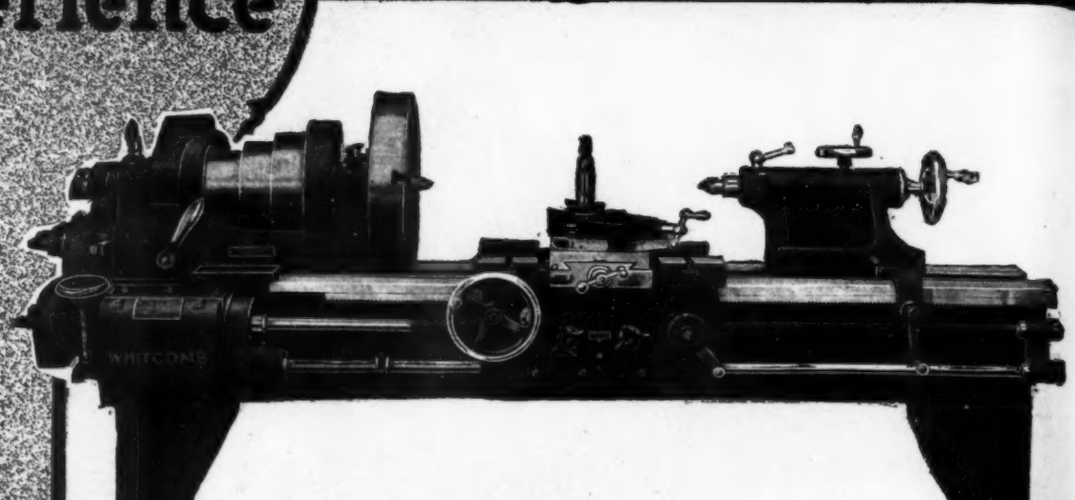
POTTER & JOHNSTON

Pawtucket, Rhode Island, U. S. A.

New York Office: Fulton Bldg., 50 Church St., Walter H. Foster, Manager. Detroit Office: Modern Machinery & Engineering Co., 1514 Ford Bldg. Chicago Office: 1001 McCormick Bldg., Chas. H. Shaw, Manager. Toronto Office: 1501 Royal Bank Bldg., E. C. Roelofson, Manager.

Foreign Offices and Representatives: Office for Great Britain, France, Italy, Belgium, Switzerland, Spain and Portugal, Potter & Johnston Machine Co., 68 Ave. de la Grande Armee, Paris, France, J. Ryan, Manager. Chas. Churchill & Co., Ltd., London, Birmingham, Manchester and Newcastle-on-Tyne, England, and Glasgow, Scotland. Ercole Vaghi, Corso Nouva, 34, Milan, Italy.

60 Years Experience



For Rapid, Accurate Manufacturing

The entire line of W-B Lathes is noted for rugged strength and extreme accuracy. There is ample power at every speed to take the heaviest cuts. They are well-balanced, powerful tools that are speedy on heavy cuts and accurate on finish cuts.

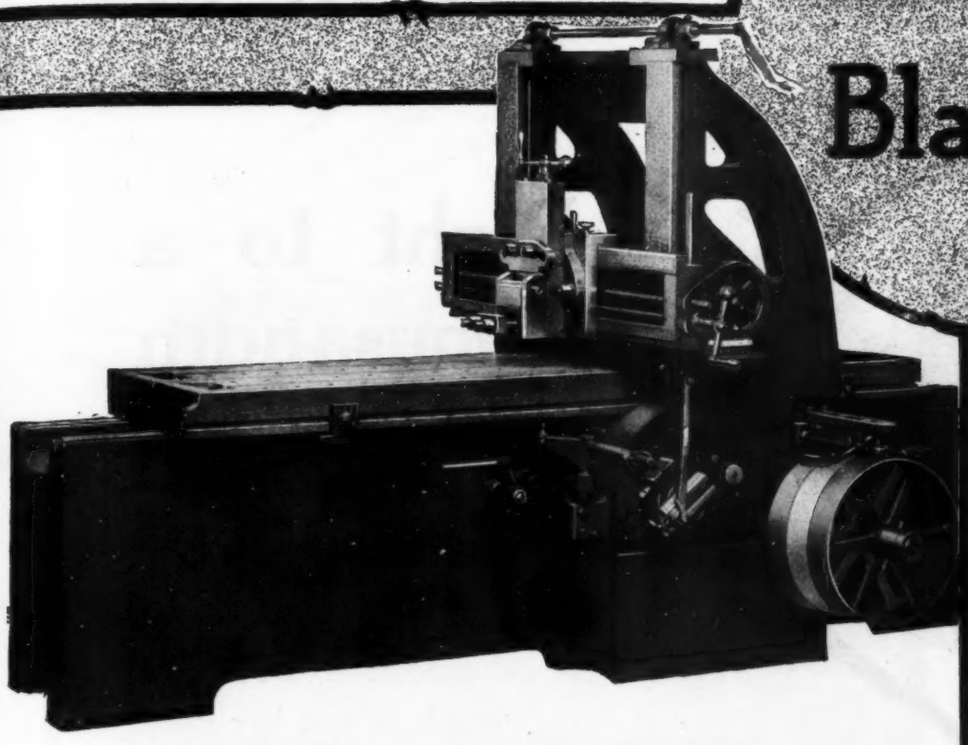
By means of the double back gears and three-step-cone pulley carrying a wide belt, nine changes of spindle speeds are obtained. Yet the effective power at each speed is far more nearly equal than in machines with single back gears and five-step-cone pulley.

Our latest Lathe Catalog gives complete details. Write for your copy.

Lathes 14" to 30" Swing

WHITCOMB-BLAISDELL
WORCESTER,

Whitcomb-Blaisdell



Second-Belt Drive Speeds Up Production

The "cushioned" reverse of W-B Second-Belt Drive Planers enables these machines to run safely at extremely high speeds which would rack to pieces the ordinary gear-driven planer. Whitcomb-Blaisdell Planers are speeding up production in many shops by running with table speeds up to 100 ft. or more per minute.

On account of the elimination of the usual spur-geared drive, friction losses are cut down and more power is delivered to the table. Another big advantage of the Second-Belt Drive is its smoothness of action and the elimination of damaging shocks and jars. This not only assists in the turning off a smooth, finely finished work, but actually prolongs the life of the planer.

Our new Planer Catalog will tell you all the strong points of the Second-Belt Drive. Write today for your copy.

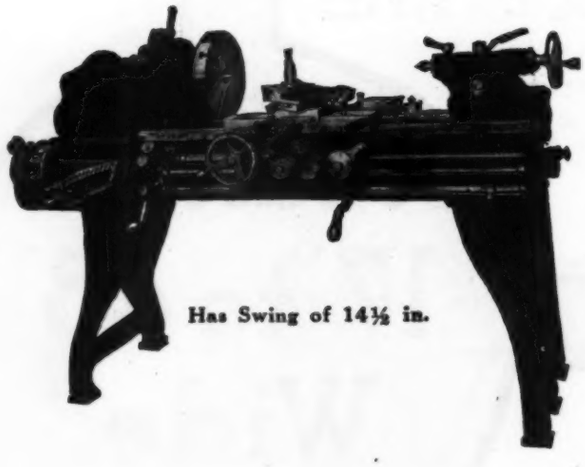
MACHINE TOOL COMPANY
MASS., U. S. A.

Planers 17" to 48" Wide

Close Coupled

Right to a Thousandth

This photograph shows alignment test which is given all lathes before shipment. Notice the length of test bar used. The Close Coupled Lathe was found to be so accurate that the U. S. Navy Department selected them to make Master gages for testing inspection gages. This is proof positive that these machines can be depended on for accuracy.



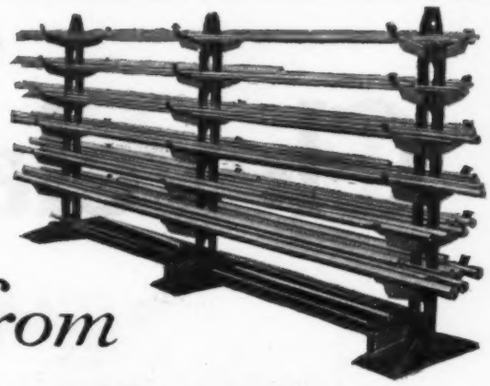
Has Swing of 14½ in.

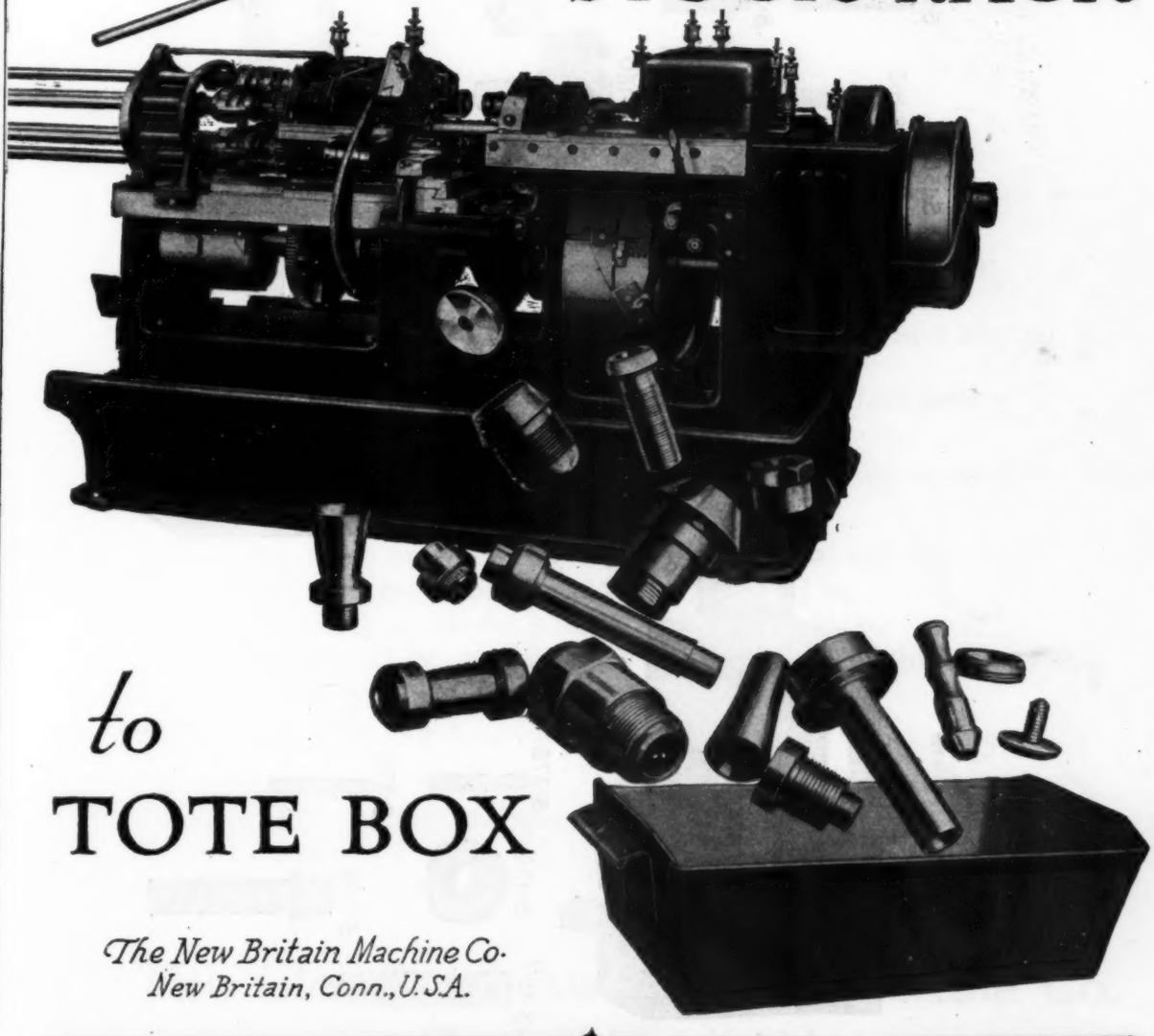
Complete Details in Circular

Davis Machine Tool Co., Inc.

Rochester, N. Y., U. S. A.

The SHORTEST ROUTE *from* STOCK RACK



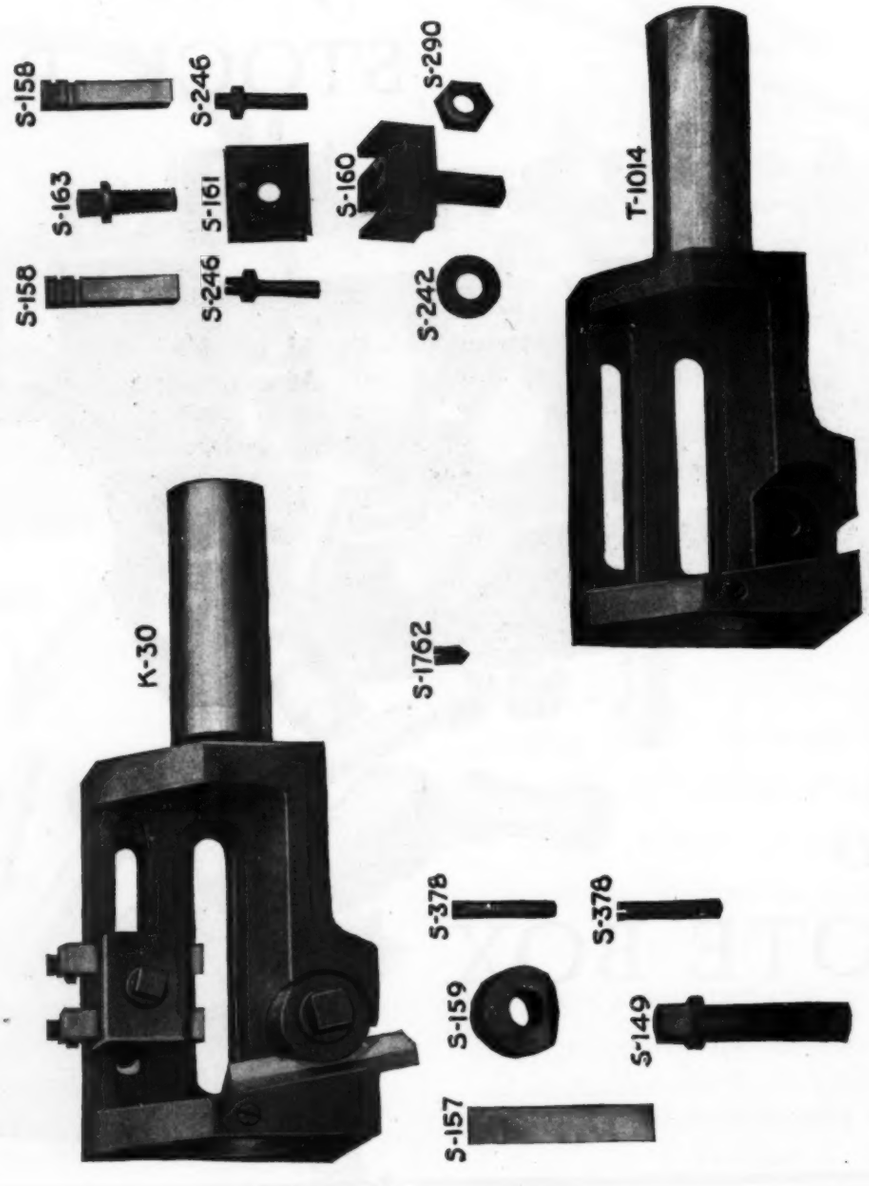


to TOTE BOX

The New Britain Machine Co.
New Britain, Conn., U.S.A.

NEW BRITAIN
SIX-SPINDLE AUTOMATICS

Cleveland Automa



tic Turret Tools

K-30—Box Mill

This mill is best adapted for turning brass, and small diameters on smooth drawn steel where shoulders to be turned and stock diameter are accurate.

The mill is furnished with one blank bushing and three cutters and is arranged regularly for cutting right hand.

The body, T 1014, varies in length. We furnish standard mills for milling following lengths.

For the $\frac{3}{8}$ in. Model A and G Machines—$1\frac{7}{8}$ in. only.
For the $\frac{5}{8}$ in. Model A and G Machines—$2\frac{1}{4}$ in. and $3\frac{1}{4}$ in. only.
For the $\frac{7}{8}$ in. Model A and C Machines—$2\frac{7}{8}$ in. and $3\frac{11}{16}$ in. only.
For the $1\frac{1}{4}$ in. and 2 in. Model A and C Machines—4 in. and 5 in.

The largest diameters that will enter this mill for our various sizes and models of machines follow:

For the $\frac{3}{8}$ in. Model A and G Machines—$\frac{1}{2}$ in.
For the $\frac{5}{8}$ in. Model A and G Machines—$\frac{7}{8}$ in.
For the $\frac{7}{8}$ in. Model A and C Machines—$1\frac{1}{8}$ in.
For the $1\frac{1}{4}$ in. and 2 in. Model A and C Machines—$1\frac{1}{2}$ in.

When ordering this mill kindly furnish the following information.

Diameter of stock to be milled.
Various lengths of milling cuts (three).
Finished diameters.
Serial number of machine.

The Cleveland Automatic Machine Co.
Cleveland, Ohio, U. S. A.

No Torsional Strain

As the driving gears are keyed to the hubs of the pinions the driving power is transmitted through the massive pinion sleeves, thus relieving the shafts of all torsional strain. This insures a smooth movement of the table, increases the life of the cutting tools, and produces better work. We are giving the valuable distinctive features of

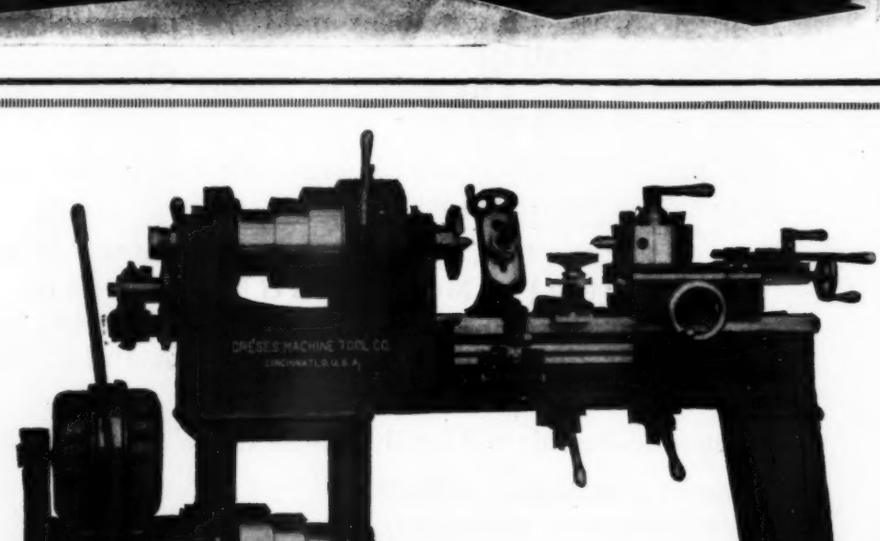
Gray Planers

week by week. If you wish the whole story write for our illustrated catalog.

THE G. A. GRAY CO.
CINCINNATI, OHIO, U. S. A.

Gray Planers
Made for those who want the best

Motor Driven Turret Lathes and Screw Machines



Geared speed changing devices are not practicable for very high speeds. The motor mounted on the head stock looks unsightly and sets up undesirable vibrations. We place the motor on a bracket close to the floor, where it takes up little room, reduces the vibration and allows a long belt for the pulleys. A rawhide pinion on the armature shaft insures noiseless running. A mechanical friction clutch starting, stopping and reversing device between the motor and lower shaft eliminates an expensive and complicated electrical controlling arrangement. For variable speed motors single pulleys instead of cone pulleys are used.

Dreses Machine Tool Co., Cincinnati, Ohio, U. S. A.

Representatives—Carey Machinery & Supply Co., Baltimore; E. L. Essley Machinery Co., Chicago; Badger-Packard Machinery Co., Milwaukee; Wm. C. Johnson & Sons Machinery Co., St. Louis; Canadian Fairbanks Co., Montreal and Toronto; Selson Engineering Co., London; Stussi & Zweifel, Milan; Manning, Maxwell & Moore, Mexico City and Yokohama.

Hess-Bright Ball Bearings

Do you make certain when you buy new equipment—

that the machine or motor you get costs less than others—not when you buy, but say in its fourth year of service?

Too often the matter of first cost clouds the facts that affect real final cost.

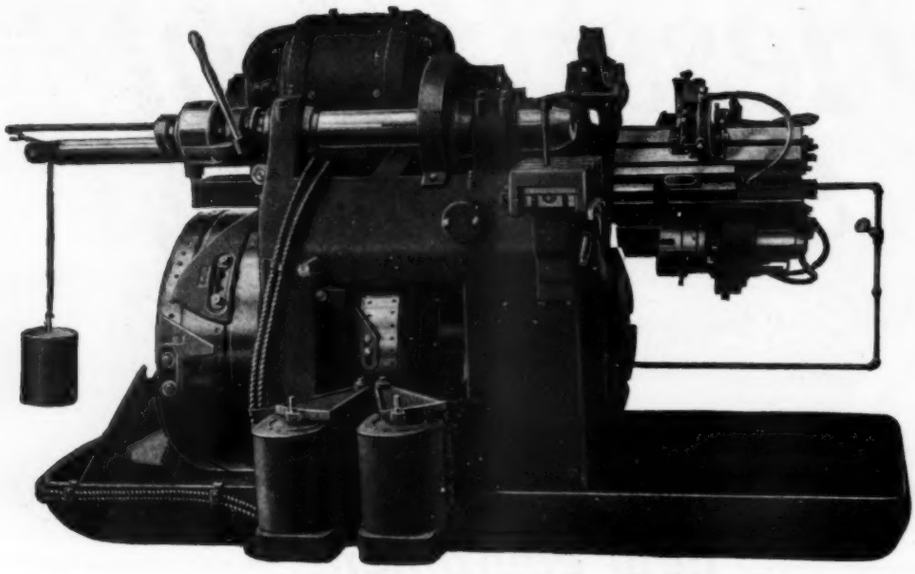
Of course the object of purchase is to get performance for the least money. It's well to remember that unless the thing you buy "stands up" in service—unless it is dependable in action, that first cost is but a part of the final.

The reverse holds true. As in Hess-Bright Ball Bearings—while they cost more to start with they are least expensive in the long run. For the first cost gets lost in the value of the service rendered. They are built to serve and by the manner of their making they live up to their reputation.

THE HESS-BRIGHT MANUFACTURING COMPANY
Philadelphia, Pa.

Where Performance takes Preference over Price

Turret Lathe Work—Automatically on GRIDLEY AUTOMATICS



Rigid holding of Turret Lathe tools for accuracy—fast cutting speeds for production—open design for quick changes of work—fully automatic control for labor economy.

May we show the specific application to your work?

Capacities up to 5-in. diameter. Belt or Motor Drive.

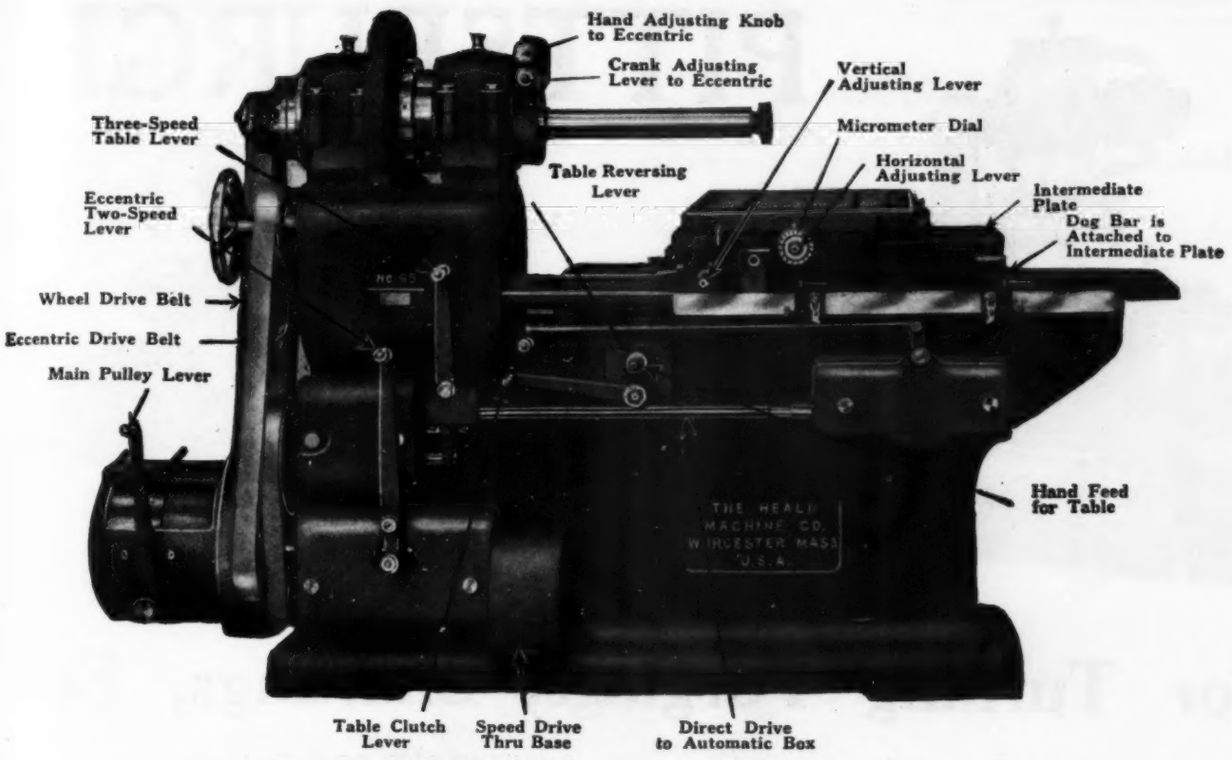
THE NATIONAL ACME COMPANY

CLEVELAND, OHIO

NEW ENGLAND PLANT, WINDSOR, VT. CANADIAN SCREW PLANT, MONTREAL, P. Q.

BRANCH OFFICES: NEW YORK BOSTON CHICAGO DETROIT ATLANTA SAN FRANCISCO
WAREHOUSES: NEW YORK AND CHICAGO. REPRESENTATIVES IN FOREIGN COUNTRIES

Makers of Gridley Single and Multiple-Spindle Automatics at Windsor, Vermont, and Acme Automatics, Threading Dies, and Screw Machine Products at Cleveland, Ohio



All There at a Glance

The New Heald No. 65

Cylinder Grinding Machine

This is a production machine carried to the highest degree of development, and is therefore of vital interest to manufacturers.

All control levers are in a very small radius, as can be readily seen.

Note also that the Dog Bar is attached to the Intermediate Plate, giving a feature never before used. The relation between the dogs, the work, and the wheel always remains the same when a vertical adjustment is made.

The frame is cast solid, giving great rigidity and stability.

Write us for further information.
Quick deliveries can be made.

THE HEALD MACHINE COMPANY

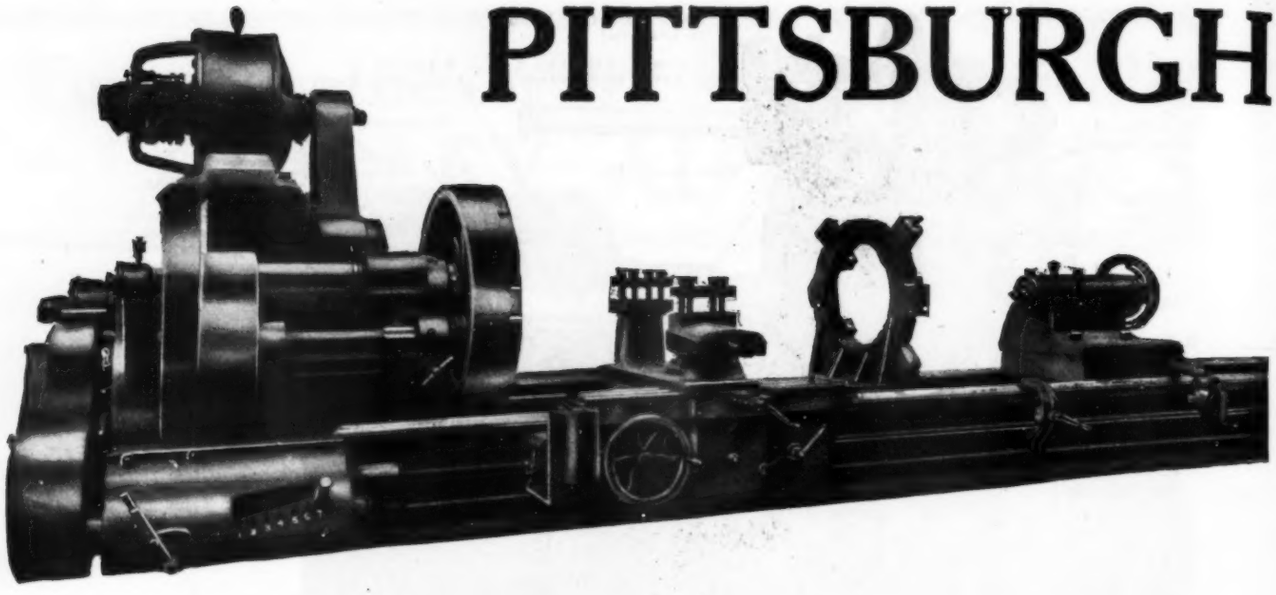
Works, Worcester, Mass., U. S. A.

New York, 839 Singer Bldg. Philadelphia, 1408 Commonwealth Bldg. Chicago, 24 Jefferson St. Detroit, 911 Majestic Bldg. Cincinnati, 311 Provident Bank Bldg. Cleveland, 1102 Swetland Bldg. Western Agents: Eccles & Smith Co., Los Angeles, San Francisco and Portland. Salt Lake Hardware Co., Utah and Idaho.

Foreign Agents: Alfred Herbert, Ltd., England, Societe Anonyme, Alfred Herbert, France, Switzerland, Spain and Portugal, Societa Anonima Italiana, Alfred Herbert, Italy. F. W. Horne Co., Japan. Wilh. Sonesson & Co., Sweden, Denmark and Norway.

HEALD

PITTSBURGH



For Turning Forgings, Shaftings, Etc.

there is nothing superior to the PITTSBURGH 50-inch Lathe.

The above cut shows the PITTSBURGH 50-Inch Lathe with Regular Compound Rest and an Extra Tool Rest at the back of the Carriage, for Long Shaft and Forge work.

The Carriage is supplied with electrically driven rapid traverse. The Controller for operating the rapid traverse is located at the left hand side of the carriage, while the large, or driving motor is controlled by a lever at the right hand side of the carriage. The carriage is supplied with our new improved double plate apron equipped with all steel gears, and case-hardened and ground shafts. The shafts in this apron are furnished with double bearings. The Rack Pinion stud has a bearing on the inside. Large frictions are furnished with sufficient driving power so that the largest cuts can be started by tightening the friction with the thumb and fingers.

The Lathe is rigid without being cumbersome and will carry the heaviest cut without vibration.

We build lathes in the following sizes: 27, 32, 36, 42 *and* 50 *inch swing.*

For further information address the

Pittsburgh Machine Tool Co., Braddock, Pa., U.S.A.

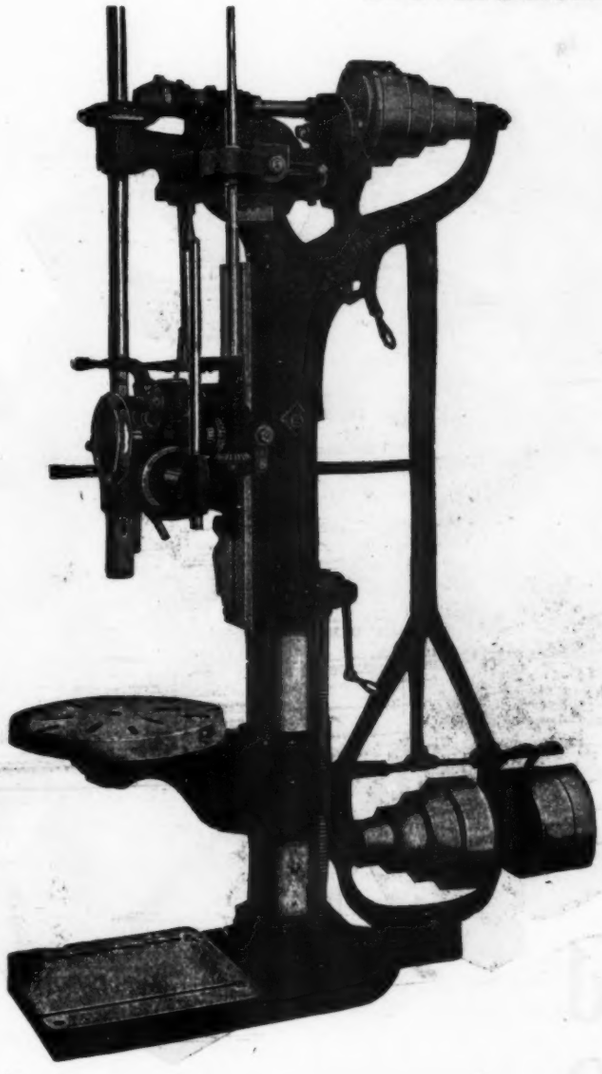
Or the following agents:

Swind Machinery Co., Philadelphia, Pa.
Backer Machine Tool Supply Co.
J. S. Miller Machinery Co., Pittsburgh, Pa.
Wolverine Machinery & Supply Co., Detroit, Mich
Duplex Machinery Co., Cleveland, Ohio.
A. D. White Machinery Co., Chicago, Ill.

Complete Line

8-inch to 50-inch swing
(with or without Tapping Attachment)

Upright Drills
Horizontal Drills
Gang Drills



BARNES DRILLS

Accuracy—Convenience of Operation—Strength

Made by

W. F. & John Barnes Co

1995 Ruby St. **Rockford, Ill., U. S. A.**

GODDARD TOOLS

Goddard Service

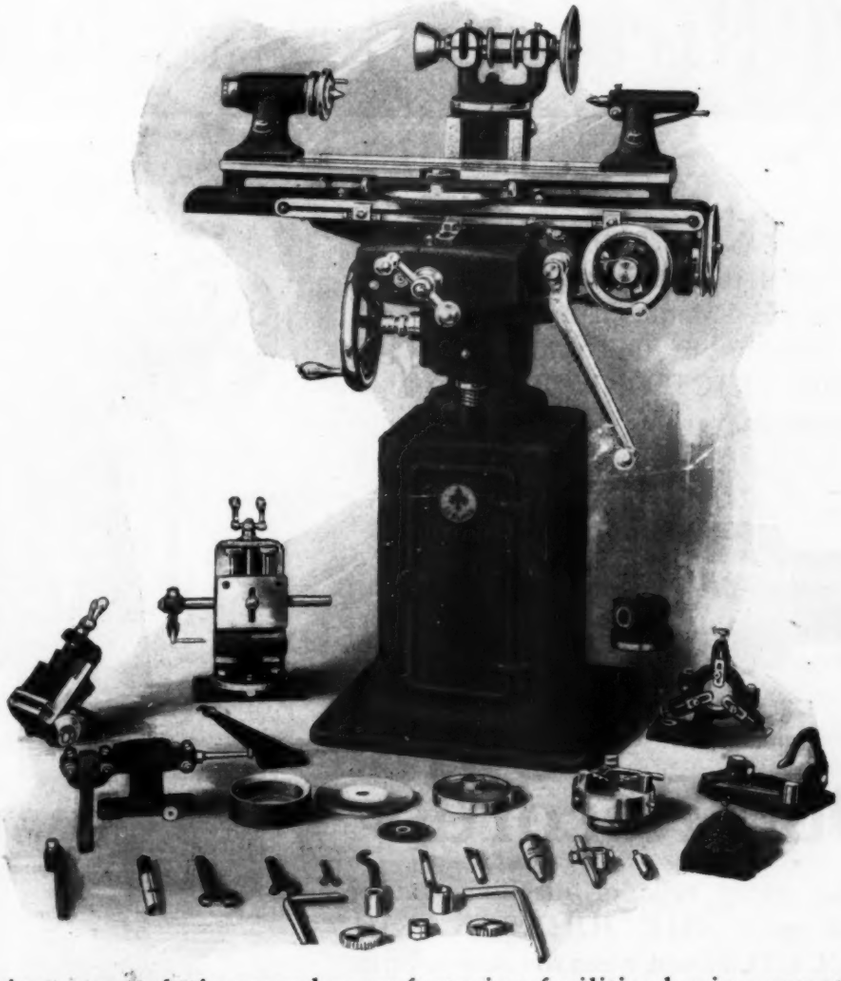
Special Tools
Standard Milling Cutters in Stock

Chicago - GODDARD TOOL CO. - Detroit

DELIVERY IMMEDIATE

OWING TO

INCREASED MANUFACTURING FACILITIES



Owing to greatly increased manufacturing facilities having recently occupied our new shops, we are now in a position to offer for immediate delivery

THE LEBLOND COMPLETE TOOL ROOM GRINDER

for Cylindrical, Internal, Surface, Gear Cutter, and every other phase of Tool Room Grinding.

Range—Table Travel—16 inches.
Cross Travel—6¼ inches.
Vertical Travel—7¾ inches.

Capacity between centers—10 in. diam. x 17 in. long.
Cutters up to 18 in. in diameter.
Saws, etc., up to 36 in. in diameter.

We have a new catalog for distribution to interested parties

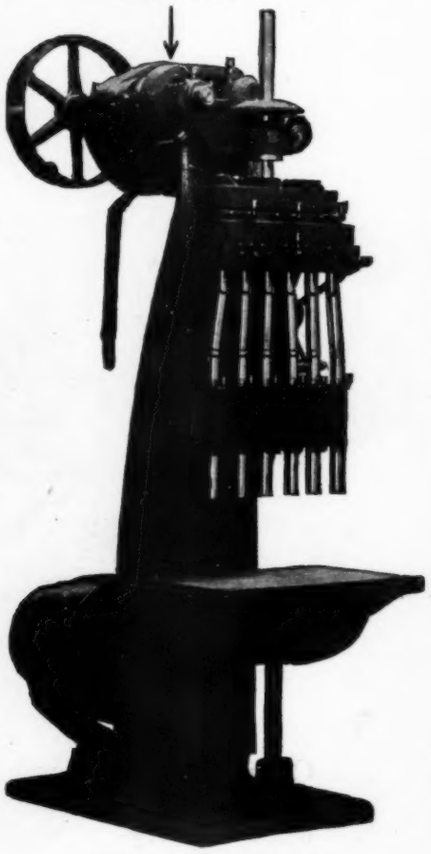
THE R. K. LEBLOND MACHINE TOOL CO.
CINCINNATI, OHIO, U. S. A.

The Johnson Friction Clutch Is Being Used As A Part Of This Machine

The JOHNSON FRICTION CLUTCH is incorporated in the throw out gears of the No. 15½ Multiple Spindle machine illustrated. This is only one of the many ways THE JOHNSON FRICTION CLUTCH can be incorporated in various designs of machine tools.

Double Clutch—Exterior

HERE



Courtesy of Foote-Burt Co., Cleveland, Ohio

Our Records

show that every type of machine can be equipped with THE JOHNSON FRICTION CLUTCH and when so equipped production is increased and operating expense reduced. Of course you are interested enough to send for our

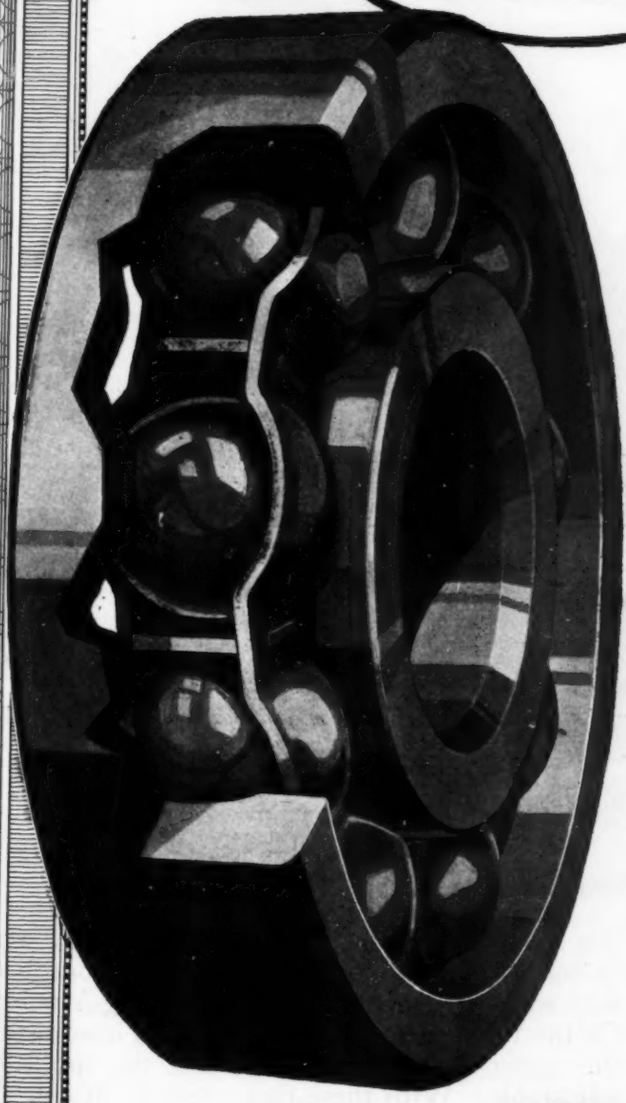
BLUE CATALOG

THE CARLYLE JOHNSON MACHINE CO.
MANCHESTER, CONN.

AGENTS:

Canada: Williams & Wilson, 320 St. James St., Montreal.
The Canadian Fairbanks-Morse Co., Ltd., Montreal and branches.
England: The Efandem Co., 22 Newman St., Oxford St., London, W. 1, Sole Agents for British Isles.
Australia: Edwin Wood, Pty., Hardware Chambers, 231 Elizabeth St., Melbourne, Victoria.
Japan: Andrews & George Co., 16 Takegawa-cho, Kiobashiku, Tokyo.
South Africa: D. Drury & Co., Main St., Johannesburg.
France: Anciens Etab. Glaenzer & Perreaud, 18 Faubourg du Temple, Paris.

Quality



MAXIMUM efficiency will now become an absolute necessity in all machinery entering the post-war competition.

Three conditions must contribute to this efficiency:—

Utmost freedom from friction in all moving parts.

Ball Bearings of almost wear-proof material.

Proper bearing sizes for the loads to be carried,—imperatively important.

New Departure ball bearings are the logical answer to each condition. Chrome alloy steel is the toughest and most enduring bearing material known.

New Departure engineers will gladly assist you with your installation. Their suggestions are based on exact knowledge, unlimited experience.

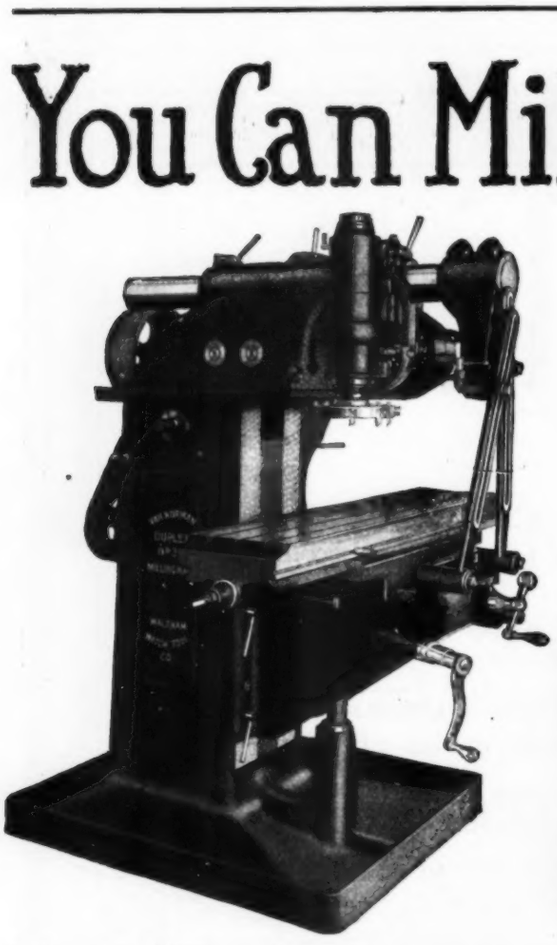
Engineering literature and free confidential consultation service are at your command.

The New Departure Mfg. Co.,
Bristol, Conn. 392 Detroit, Mich.

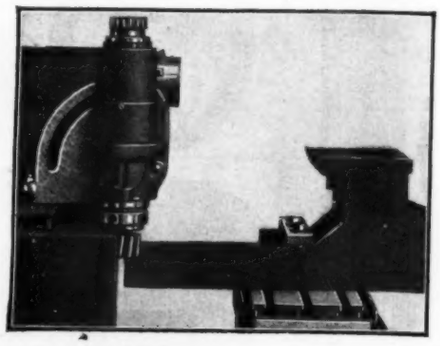
Conrad Patent Licensee.

New Departure Ball Bearings

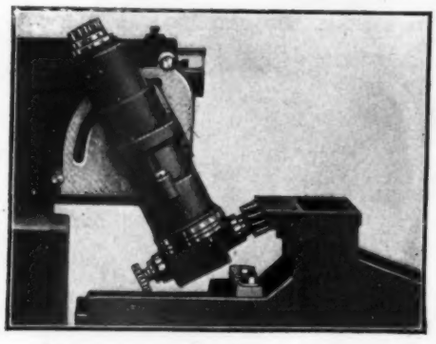
You Can Mill at More Angles



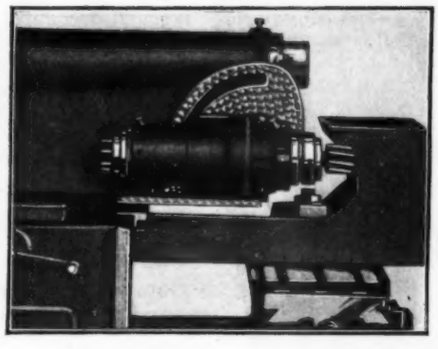
No. 3 "Duplex" showing the Ram extended over the table and Cutter Spindle set in a vertical position



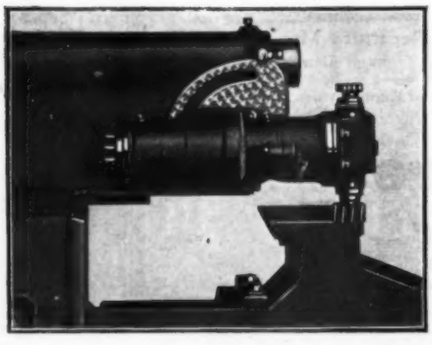
Ram drawn back and cutter in main head operating close to the column of the machine.



Cutter in sub-head milling bevel surface 17 in. from the column.



Cutter in main head in horizontal position operating 17 in. away from the column.



Sub-Head mounted on main head cutting 22 inches from the face of column.

The pictures demonstrate only in part the extraordinary range of work that can be accomplished with the Van Norman Duplex Milling Machines. On the Van Norman Duplex the ram is adjustable, the cutter head is adjustable and the subhead is adjustable. With these three devices in combination you can well imagine the number of cutting angles obtainable. So many different angles that you cannot picture them adequately. Nor do you need to shift the work. Think of the saving in jigs and fixtures—and the speed of such a machine in a tool room.

You should learn the latest improvements.

Write today.

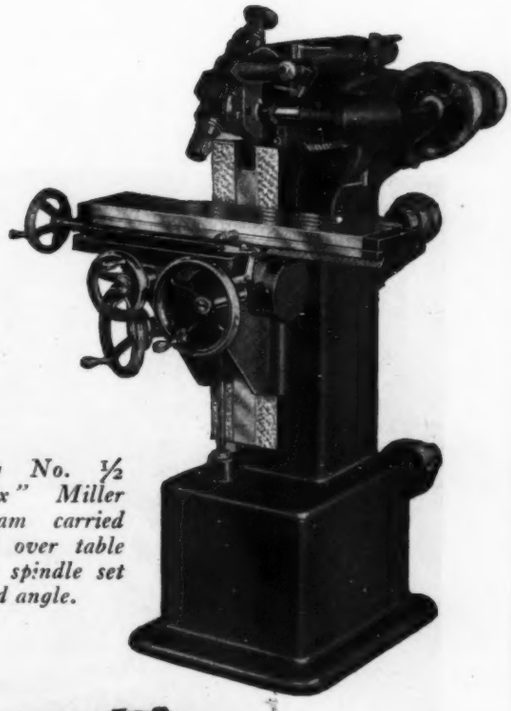
Than You Can Picture with the VAN NORMAN

At one set up with the Van Norman No. ½

This astonishing piece of work demonstrates the angles and curves that can be cut with the Van Norman Duplex No. ½ at one set up. The same right-angle end mill machined this whole job with one setting of work.

If the Van Norman can do this without any additional fixtures and with a single cutter, is there anything in your tool room it cannot handle? Certainly no work of this type. The unlimited range is due to the adjustable ram and cutter head.

If you don't know about the Van Norman don't waste time. Get in touch with us today.



Showing No. ½ "Duplex" Miller with ram carried forward over table and the spindle set at an odd angle.

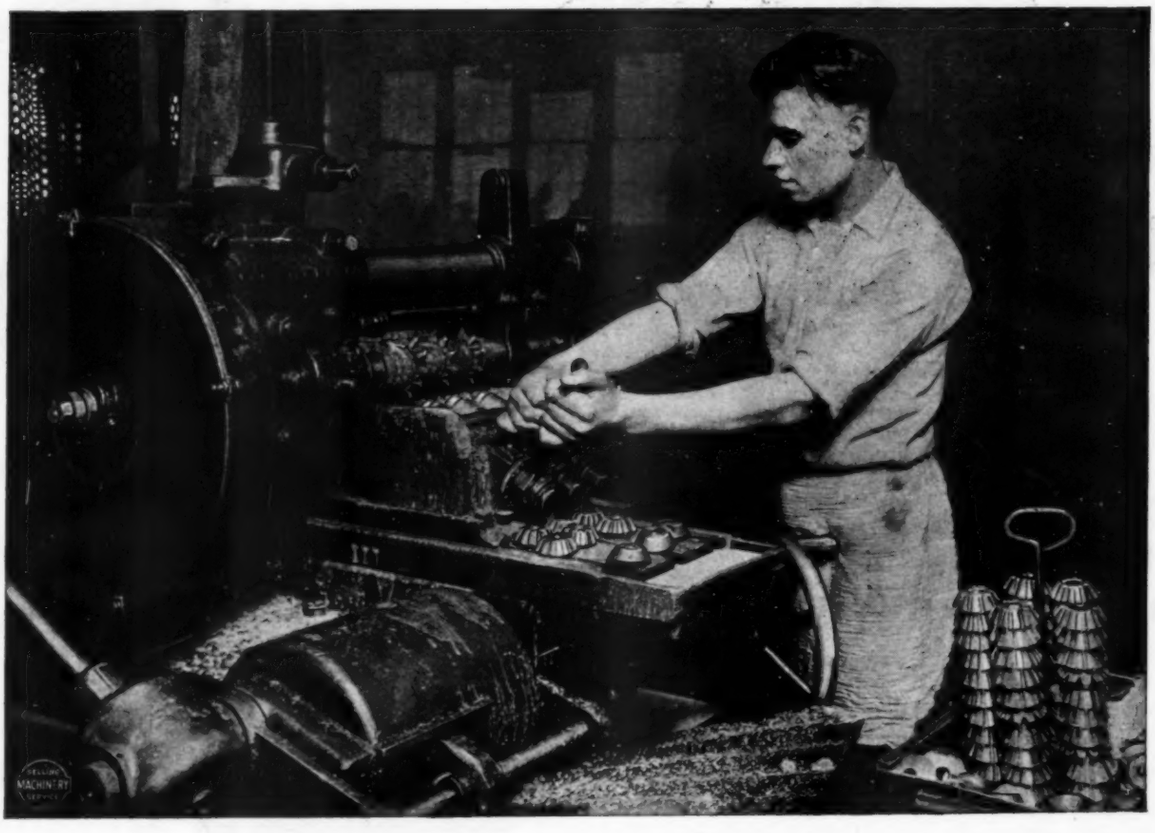
Showing No. ½ "Duplex," with the ram drawn back and the spindle set in a horizontal position.

Van Norman Machine Tool Company

Wilbraham Avenue, Springfield, Mass.

Agents for Great Britain, Alfred Herbert, Ltd.

KEMPSMITH



THE KEMPSMITH MANUFACTURING COMPANY

MILWAUKEE, U. S. A.

KEMPSMITH

One Every Minute

Roughing Bevel Pinions on the

KEMPSMITH

The machine in the photograph was not especially designed as a gear cutter. It is a Kempsmith Lincoln Type Miller giving another demonstration of its unusual adaptability. It is roughing out small bevel pinions, which are mounted three at a time on a special indexing fixture and finished at the rate of three every three minutes—one a minute. This Kempsmith Miller is one of nine at the plant of the Brown-Lipe-Chapin Company of Syracuse, N. Y. Three of these machines have been in service more than sixteen years, six more than ten years; all have been running day and night for the last five years.

May we send further evidence of Kempsmith serviceability? The line includes Plain, Universal and Lincoln Types.

THE KEMPSMITH MANUFACTURING COMPANY

MILWAUKEE, U. S. A.

NEWTON

Upright Generating Planers

More Familiarly Known as

Slotting Machines

36 in. to 72 in. (maximum) stroke.

Will finish irregular, vertical, flat and concentric curved surfaces with but one setting. *Catalog No.* 49 gives sizes, types and features.

Newton Machine Tool Works, Inc.
23rd and Vine Sts., Philadelphia, Pa.
U. S. A.

BRIDGEFORD

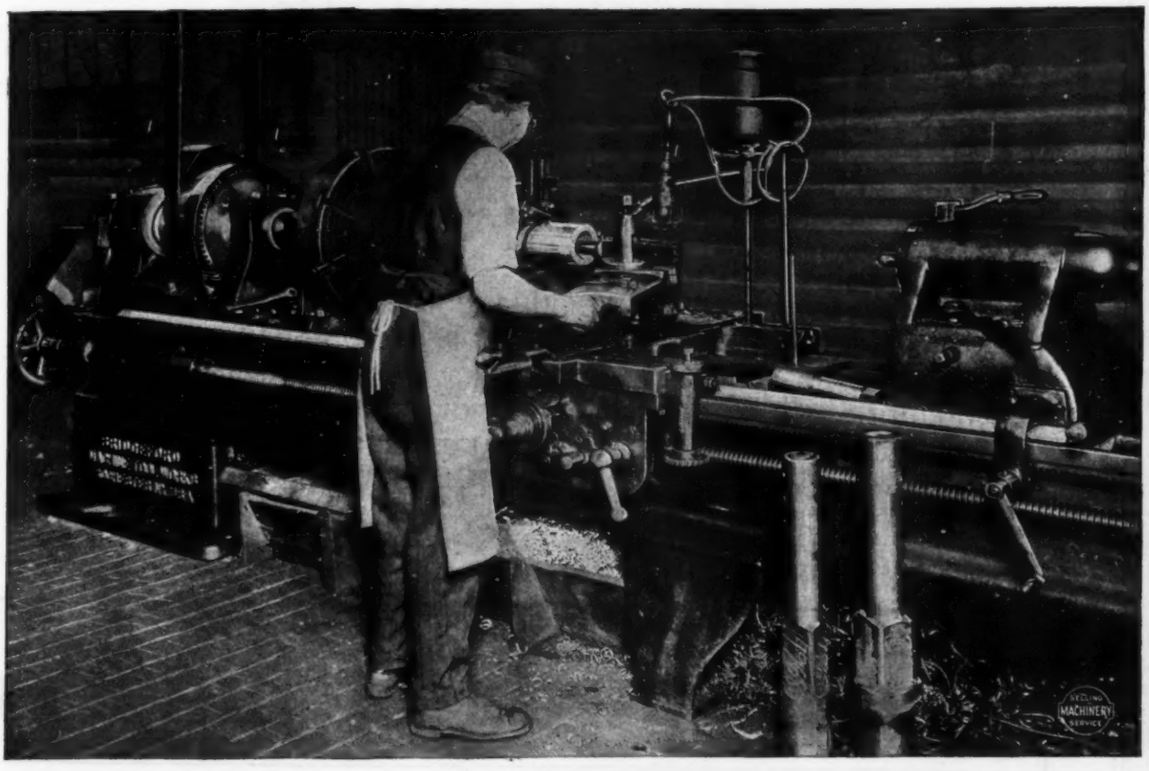
Five Bridgeford Lathes— Fifteen Years of Satisfactory Service

THE Keystone Driller Company's plant at Beaver Falls, Pa., is equipped with five Bridgeford Lathes, part of which have been in steady operation for close to fifteen years.

The lathe shown in the accompanying photograph is machining oil well driller rope sockets, two of which may be seen in the foreground. Production ranges from six to ten per day, depending on the size of the forgings, which are of steel.

Incidentally, the Bridgeford Lathe is as economical in the production of these little 60-pound parts as it is in the handling of the giant castings which the mention of Bridgeford ordinarily calls to mind.

Let us send details of Bridgeford design and construction.



BRIDGEFORD MACHINE TOOL WORKS

Manufacturers of Heavy Duty Lathes for More than 20 Years

177 WINTON ROAD **ROCHESTER, N. Y.**

BULLARD

Representing the best that we have learned in thirty-five years of machine building—

The BULLARD MAXI-MILL

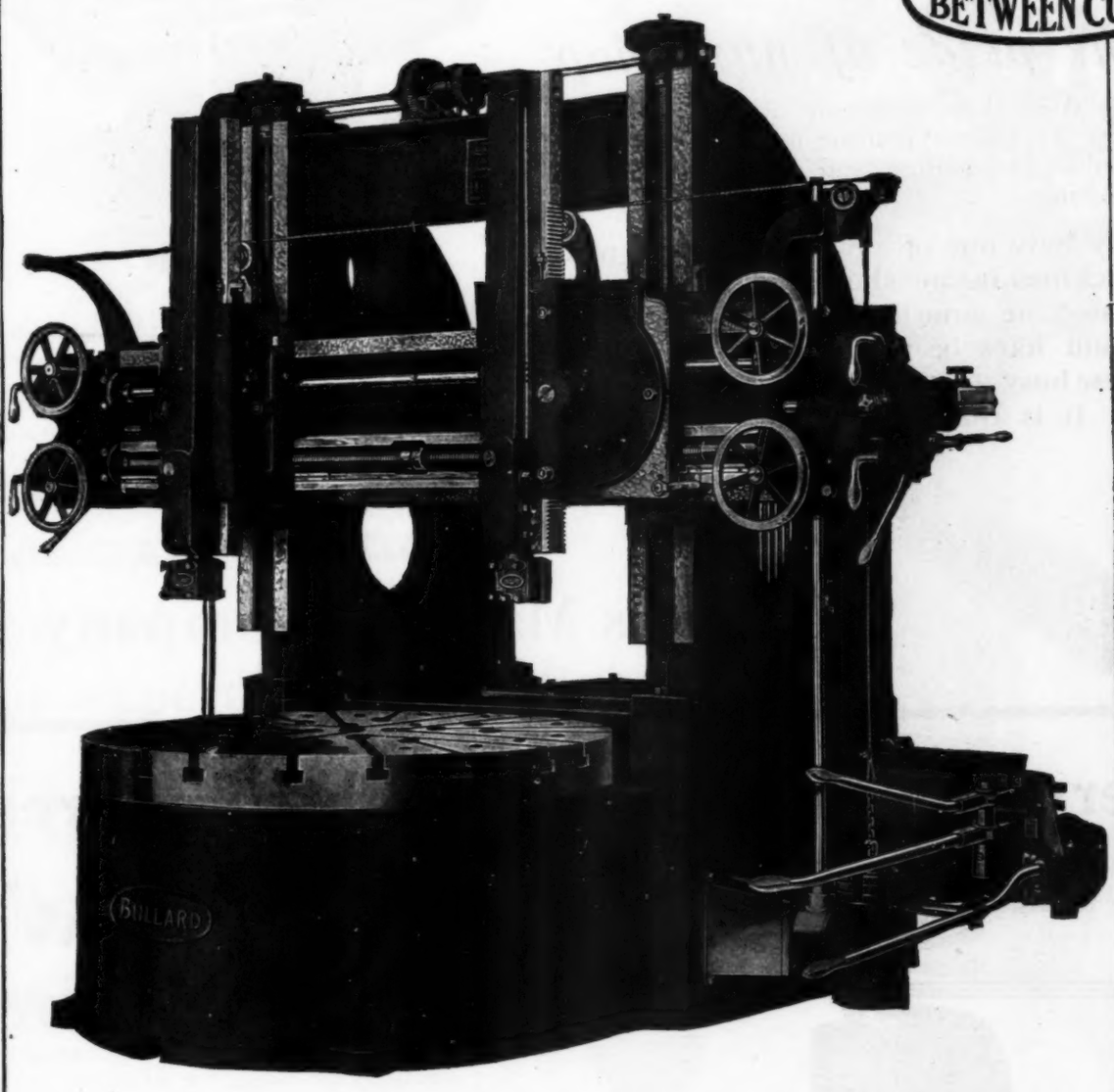
The knowledge and experience gained in building more than ten thousand machines of the vertical type have gone into the design of the Bullard Maxi-Mill.

The main features passed the experimental stage years ago. The drive, feed works, spindle construction, rail construction, lubricant system and other units have become practically standardized. Their application to the new machines makes success a matter of foregone conclusion.

In addition to many other valuable Bullard features, the Maxi-Mill possesses a cutting lubricant system which enables the coolant to be used in large and effective quantities without the possibility of its entrance into the machine itself. In this particular especially the Bullard 61-in. Maxi-Mill is unique.

The Bullard Machine Tool

CUTTING TIME BETWEEN CUTS



Deliveries are good. Write for full details
Sizes, 44-in., 54-in., 61-in.

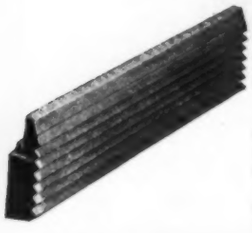
Co., Bridgeport, Conn.

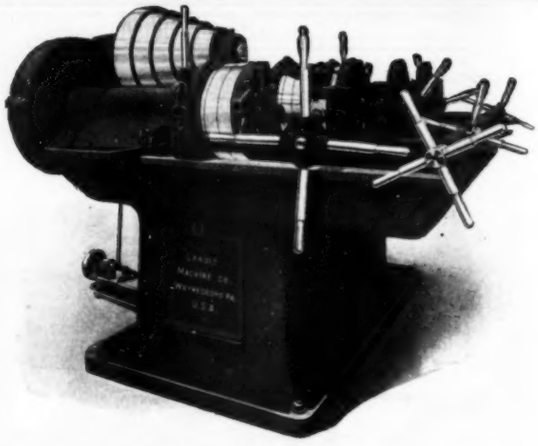
LANDIS

—*the pride of our shop*

The Wm. Haas Company of Dayton, Ohio, write as follows concerning a 2-in. Landis Double Head Pipe and Nipple Threading Machine—

"We have one of your double head pipe machines in our shop now, having purchased the same in 1913, and we certainly would have been up against it during these busy times if we would not have had it. It is the pride of our shop and it certainly delivers the goods."





The Landis Die Head and Machine "delivers the goods" because the chaser embodies these features: long life; variable rake angle, which permits of a grinding to suit material being threaded; high cutting speed; interchangeability of chasers, which means that one or more of a set can be replaced without renewing the entire die; right- and left-hand threading with the same set of chasers and the absence of annealing, hobbing and retempering.

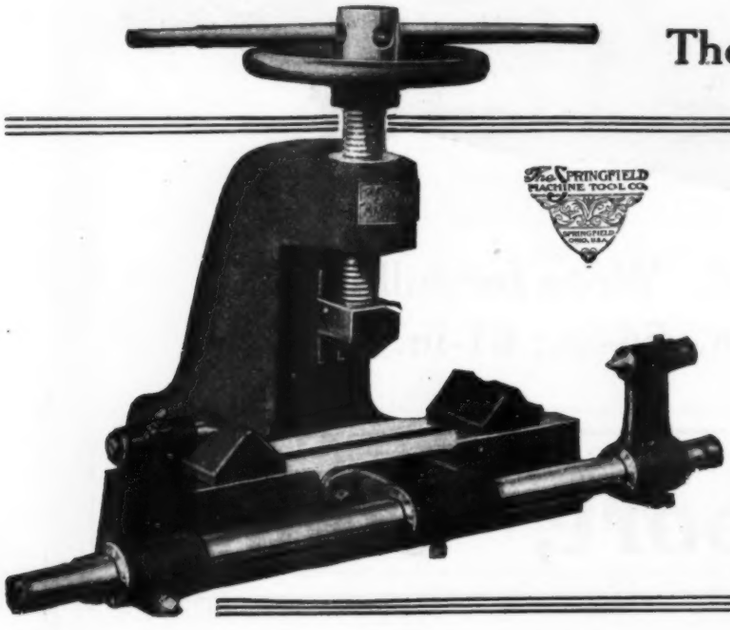
Write for further details—they are given in Catalog No. 24.

Landis Machine Company

Waynesboro, Pa.

Every Shop Needs This Straightening Press

The Springfield



For centering and straightening work in the rough, for straightening pieces sprung in use, and for reamers, etc., sprung in tempering, it has no equal.

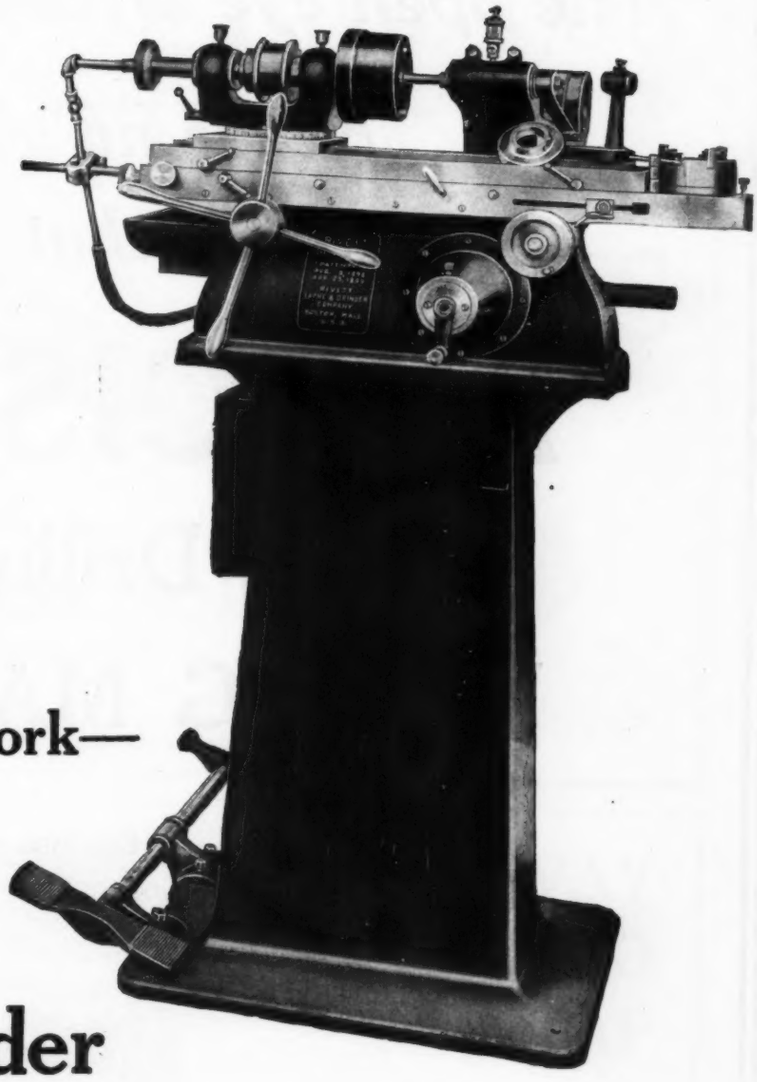
Illustrating the versatility of this press for handling a wide range of work, garages are now using it to an amazing extent—the Ford Motor Company alone having more than 700 in operation at their various plants.

Get our Circular No. 101.

The Springfield Machine Tool Company

Springfield, Ohio, U. S. A.

RIVETT Quality



For manufacturing,
for tool room, or
for experimental work—

The Rivett No. 103 Internal Grinder

This machine is full automatic in its action. Its range is holes from 1/64 to 2 inch diameter. Its speed adapts it to volume production on small part work, while its exceptional accuracy makes it a valuable machine on tool room or experimental work.

Write us for full details—and the Rivett Catalog.

RIVETT LATHE & GRINDER CO.

Brighton District of Boston Massachusetts

"The open eye of the open mind"

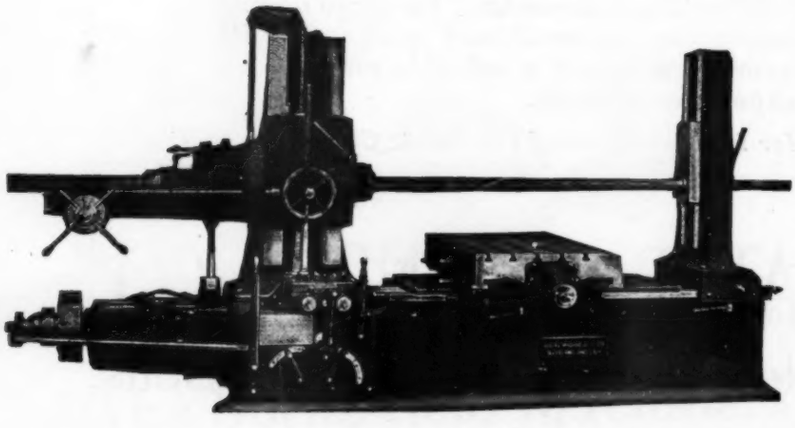
Needs no glass
to see that the

"PRECISION"

Boring, Drilling and MILLING MACHINE

Is the nearest approximation to perfection in the selection of details important in machine design.

These details are given as far as possible in a circular which we would like you to send for



LUCAS MACHINE TOOL CO.

NOW AND ALWAYS OF

Cleveland, Ohio

THE STANDARD TOOL CO'S TWIST DRILLS

Trade Mark

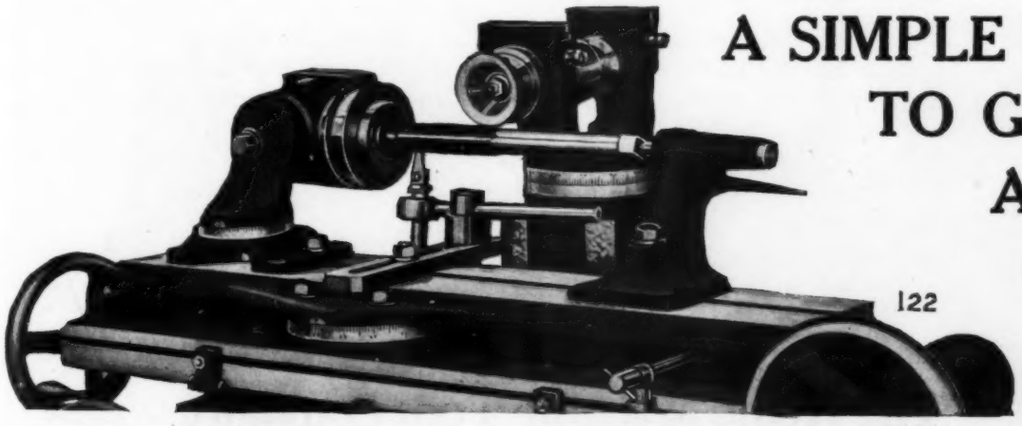
CARBON and HIGH SPEED

For Every Purpose

THE STANDARD TOOL CO.

CLEVELAND, OHIO

New York Store at 94 Reade St.
Chicago Store at 552 W. Washington Blvd.
Great Britain—Burton Griffiths & Co., Ltd., London
France—Burton Fils, Paris
Switzerland—J. Lambercier & Cie, Geneva
Denmark—Nienstaed & Co., Copenhagen
Japan—The F. W. Horne Company, Tokyo



A SIMPLE WAY TO GRIND A TAP ON—

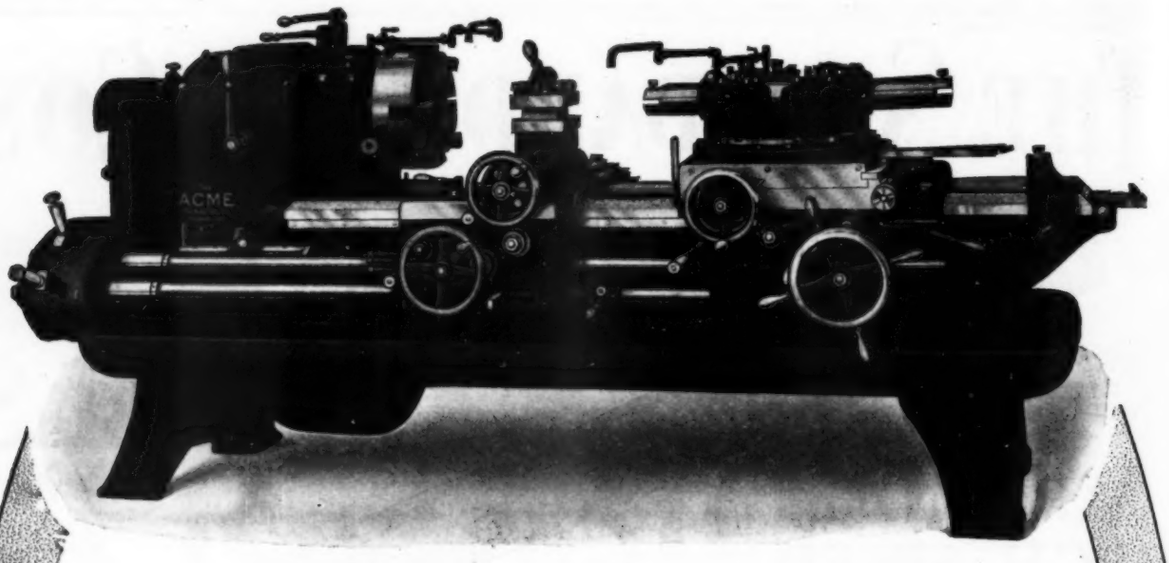
The OAKLEY NO. 2

In order to assure positively radial grinding, the centers are first brought in line with the face of the grinding wheel. The tap is then placed between the centers, and the tooth rest secured to the table as shown.

The tooth rest may also be fastened to the work head, if desired.

Table stops are set to regulate travel Either lever or screw feed is used.

The Oakley Machine Tool Company, Cincinnati. Ohio



A Great Triumph In Machine Tool Building

The Cincinnati Acme No. 3 Universal Flat Turret Lathe that we are now offering to the trade is the realization of things hoped for.

It has been justly christened "The Flat Turret Lathe Pre-eminent," for it is the consummate product of ripe experience in machine tool building.

And when we say that, we mean more than may appear on the surface. We mean that this machine has every possible advantage in the way of time- and labor-saving features—that extreme accuracy and reliability may be taken as a matter of course—that materials and workmanship, design and construction, are all of the highest order.

Our illustrated Bulletin describes this lathe fully and gives a partial list of prominent users of Cincinnati Acme machines.

Write for a copy.

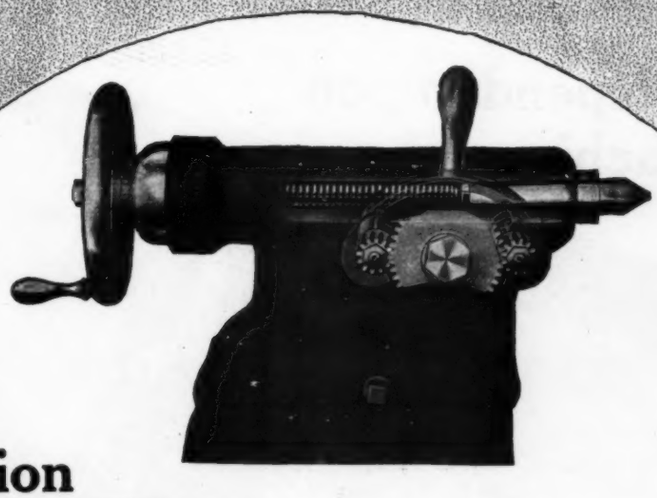
The Acme Machine Tool Company

Cincinnati, Ohio

CINCINNATI ACME

No. 3 UNIVERSAL FLAT TURRET LATHE

THE FLAT TURRET LATHE PRE-EMINENT



The Extension TAILSTOCK

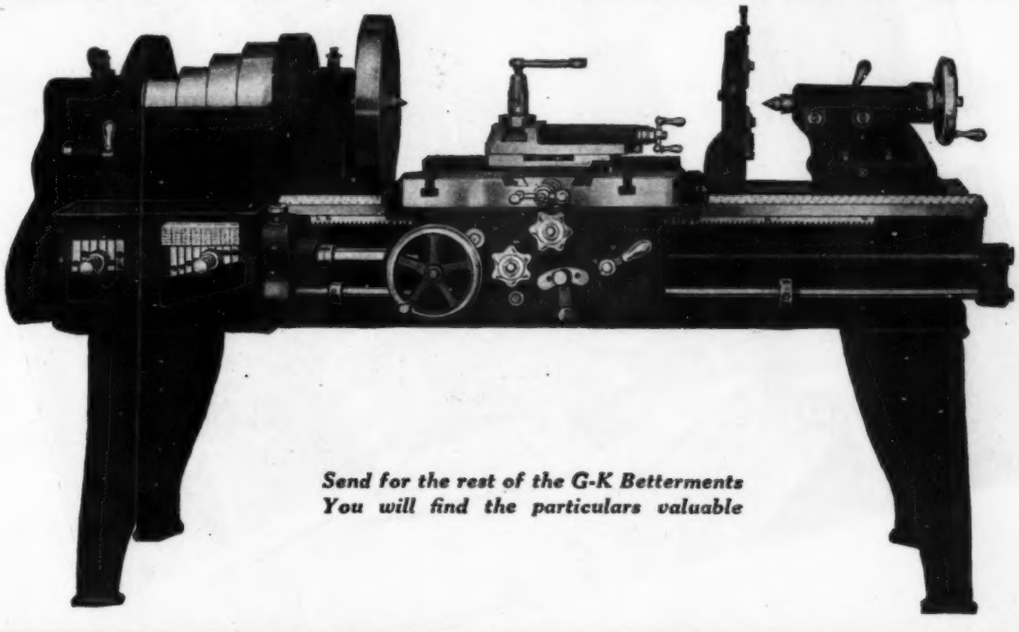
G·K·QUALITY LATHES

Note the extension of this "Bull Dog" Tailstock.

This G-K feature provides the necessary clearance to the Carriage Bridge for turning short work and permits the swiveling of the Compound Rest ninety degrees.

This Tailstock Betterment is clamped in position by three bolts, all accessible from the front of the machine.

The spindle is firmly clamped at both ends of the barrel by two sets of floating binders operated by a single handle. Thus the spindle never gets out of alignment.



Send for the rest of the G-K Betterments
You will find the particulars valuable

GREAVES KLUSMAN TOOL COMPANY

Cincinnati, Ohio, U. S. A.

The Fairbanks Company, New York City. The Fairbanks Company, Phiadelphia, Pa. The Fairbanks Company, Boston, Mass. The Fairbanks Company, Washington, D. C. Federal Machinery Sales Company, Chicago, Ill. J. R. Stone Tool & Supply Co., Detroit, Mich. Marshall & Huschart Machinery Company, St. Louis, Mo. William K. Stamets, Pittsburgh, Pa. Hallidie Machinery Co., Seattle, Wash. Hallidie Company, Spokane, Wash. Neill, Laville Supply Co., Louisville, Ky.

A lot depends upon this machine

CINCINNATI

Read what This user of the Cincinnati has to say

"The Cincinnati Planer" states Mr. Stranfuss of The Clyde Iron Works of Duluth, "has given us entire satisfaction for a number of years. Upon it largely depends our whole output. It is mainly used in connection with planing the bed plates for steam engines, electric hoists, gasoline engine hoists and the like.

"Some of these castings are semi-steel and some cast steel. They run anywhere between 72 inches in width to from 6 to 15 feet in length. Of the larger size in cast iron or semi-steel, we are able to plane about three in ten hours; of the cast steel we plane one in fifteen hours. We take heavy cuts and heavy feeds on this machine, depending, of course, on the nature of the material.

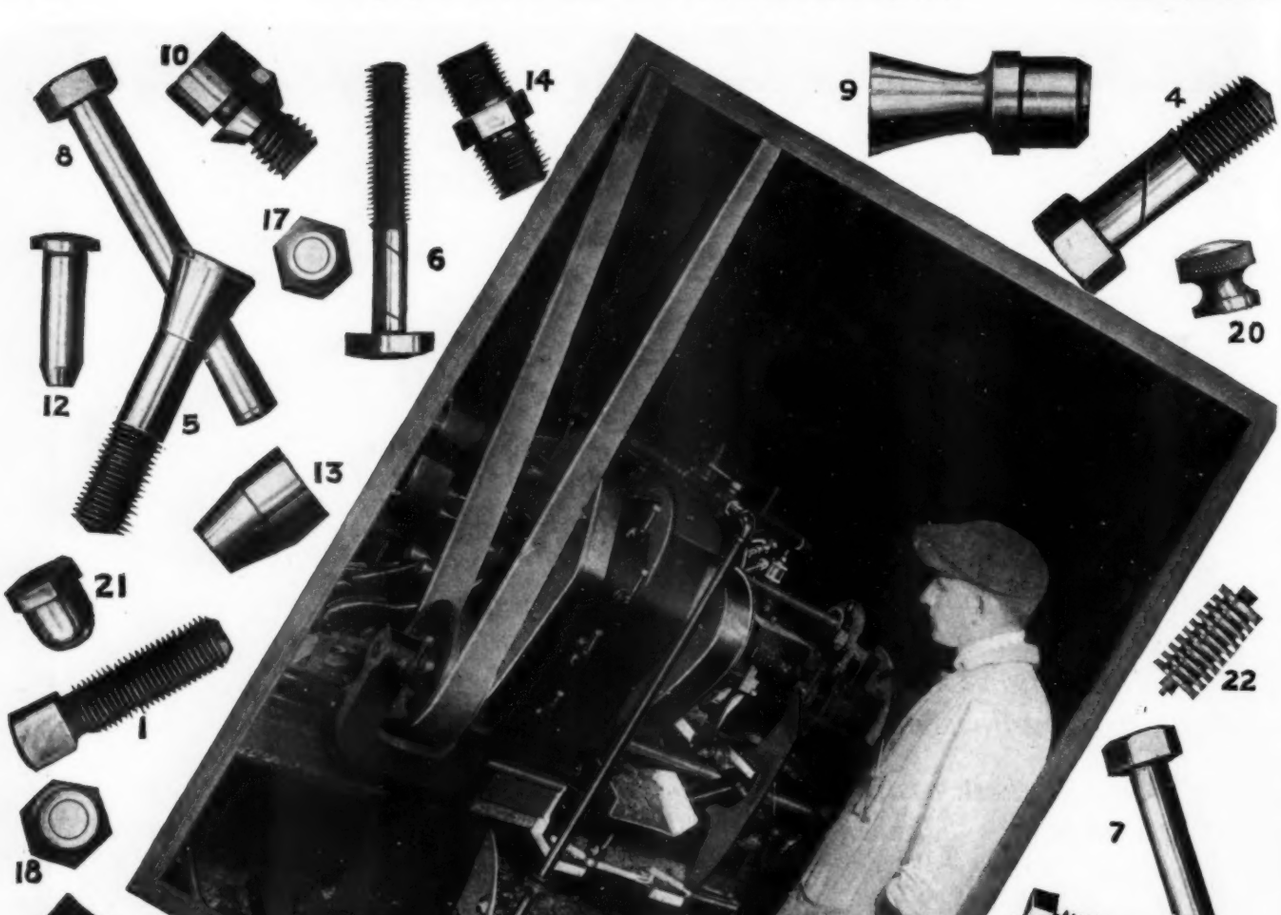
"The planer is running from morning to night without interruption and very often late into the night.

"The repair on the Cincinnati and the up-keep are so negligible that considering the service, it is hardly worth mentioning.

"We consider the machine a first class tool in every respect and well worth its investment."

We have Cincinnati Planers to meet every need of modern production. Let us take up your problem with you.

PLANER CO. CINCINNATI OHIO, U.S.A.



Per Hour	No.	Piece Turned Out by Cincinnati Automatic Screw Machine			
600	No. 17	5/16-24-C nut			
514	No. 18	3/8-24-C nut			
450	No. 19	Special Bushing	No. 2 Special Nut Brass	No. 23 Link Belt Roller	
360	No. 12	5/16 x 1 in. Clevis Pin	No. 13 3/8 x 7/8 Special Bushing		
300	No. 3	1/2 x 1 1/4 cup pt. set screw s and d	No. 20 Special Bushing	No. 24 3/16 x 5/8 spc. Screw	No. 1 3/8 x 1 1/4 cup pt. Set Screw SAE
250	No. 22	Indicator Roller Brass			
225	No. 8	5/16 x 12 in. Cap. Screw Block	No. 11 Spec. Set Screw		
200	No. 6	1/4 x 1 1/8 Spc. Fil. Nd. Screw	No. 10 Spec. Set Screw		
150	No. 5	3/8 x 2 in. Spec. Studs	No. 16 Firing Pin spec.		
105	No. 9	Priming Cap			
100	No. 4	7/16 x 1 1/2 HX Cap Screw SAE			

From 100 to 600 per hour with the

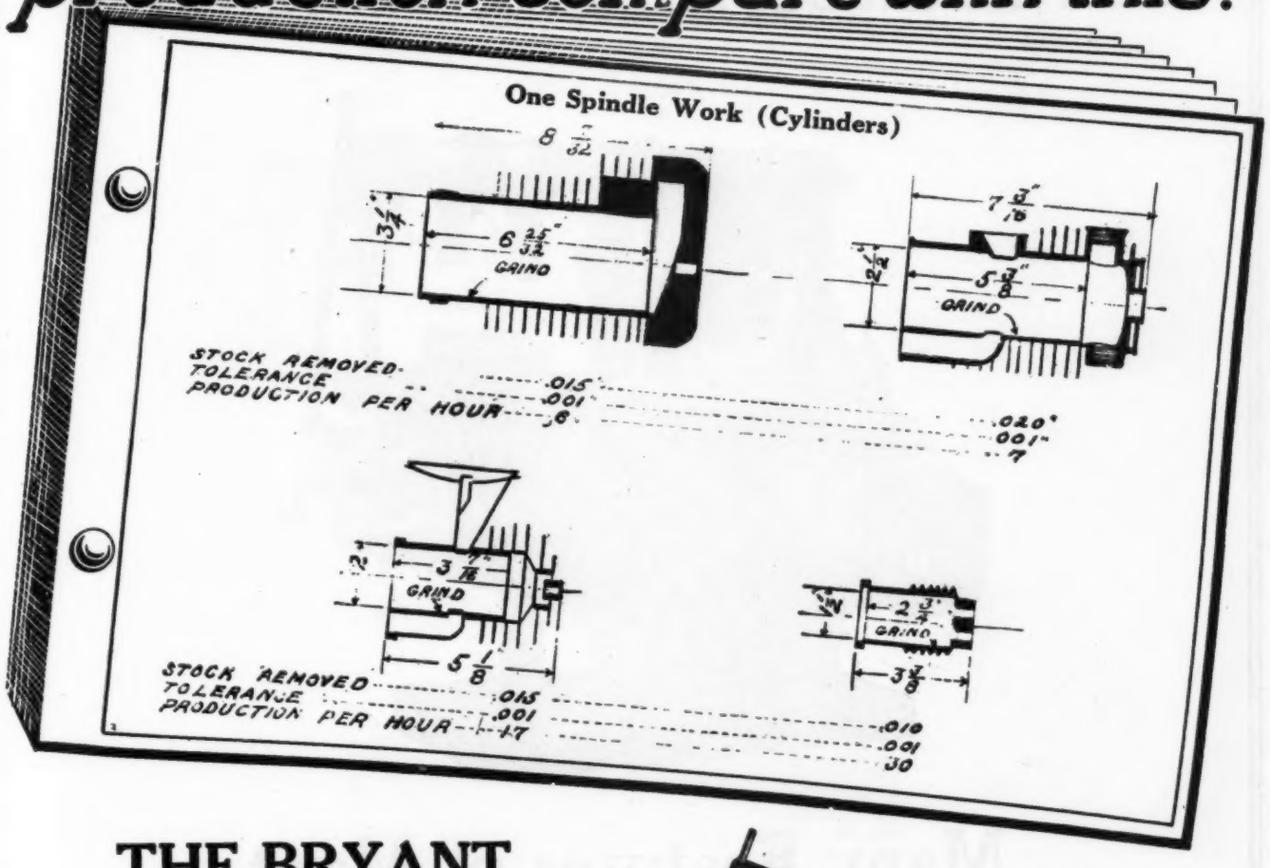
Cincinnati 5-Spindle Automatic

(Courtesy of Cincinnati Screw Company at whose plant photo was taken)

CINCINNATI AUTOMATIC MACHINE CO.

OAKLEY, CINCINNATI, OHIO

How does your hole grinding production compare with this?



THE BRYANT Deep Hole Grinder

Automobile and motor cycle engine cylinders of the single unit type can be profitably finished with the Bryant. Our latest machine — the Bryant Deep Hole Grinder — has made an enviable record in the production of Liberty motor cylinders. The cylinders are handled in loading sleeves which fit the chucks used in both the roughing and finishing operation.

The chucking problem in jobs of the kind illustrated above is a considerable factor in obtaining high production.

For this reason, we are prepared to design and furnish special chucks for special work to cut chucking time to the minimum.

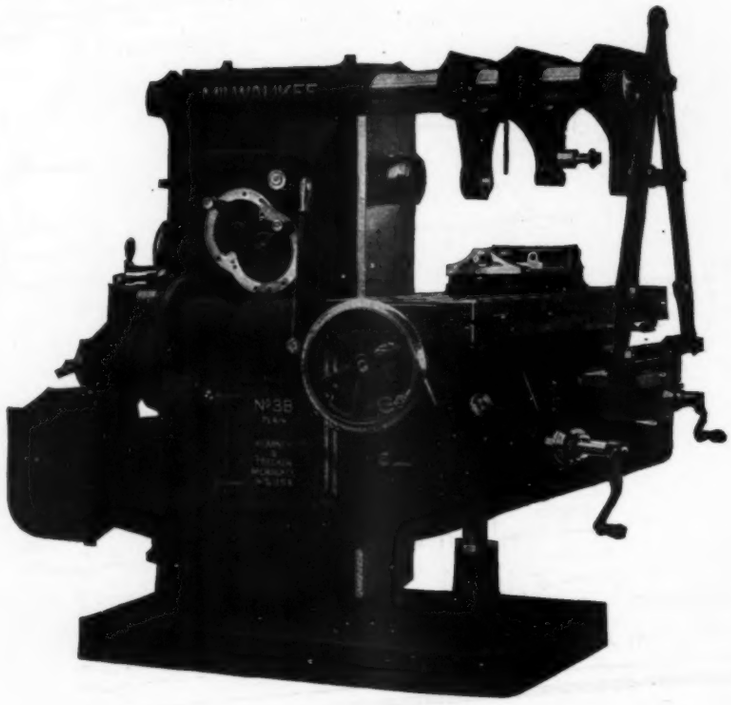
Write for full details and a copy of the Bryant Production Book.

BRYANT CHUCKING GRINDER COMPANY

Springfield, Vermont, U. S. A.

Detroit Office: 932 Dime Bank Bldg., Detroit, Mich. Motch & Merryweather Mchy. Co., Agents in Cleveland, Cincinnati, Pittsburgh. All other territory covered by our Company's representatives.

Milwaukee Milling Machines



Many Features of Merit

The column is a one-piece box section casting with few and small openings. The base is made pan shape to catch splashing oil and chips. The dovetail of the knee slide is extended upward to the overarm for the effective affixing of attachments.

The knee is also a box section casting without holes or slots through the top to close under pressure and impair the alignment of the work. The bearing of the knee on the column is extended well above the saddle slide.

The double overarm provides for positive alignment of the arbor and prevents it from being pounded out of line when using large, coarse pitch cutters on rough, heavy work. Cutters can also be used at a greater distance from the face of the column.

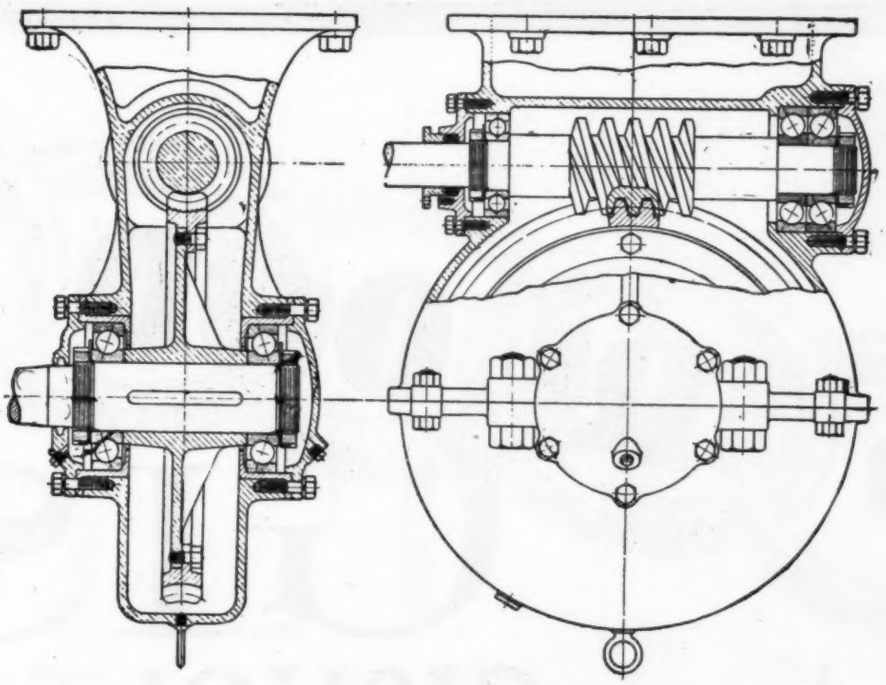
The spindle has a large flange forged on the end. This flange carries keys for driving large face milling cutters that are attached directly to the flanged end by means of four bolts and also for driving the hardened steel arbor drive collar. The arbor drive collar protects the end of the spindle from injury, so that when face milling cutters are attached they run true. The reverse for the spindle is self-contained within the machine, no overhead apparatus being necessary.

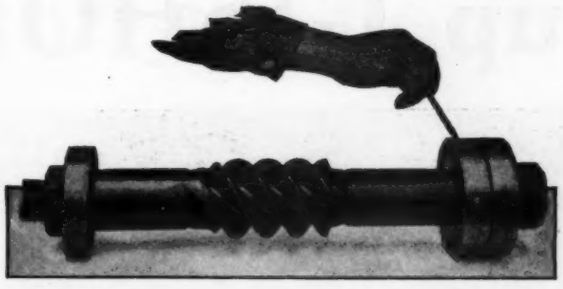
All gears and bearings in the column and feed box are automatically flooded with lubricant that is pumped to the top of the machine and distributed by a perforated pipe, flooding downward and thoroughly lubricating the gears and bearings.

Every Milwaukee Milling Machine is equipped with a cutter lubricating system which is an integral part of the machine. This equipment was considered in the original design and is not added as a separate item. The cutter lubricating system operates only when the spindle is running.

Complete facts regarding Milwaukee Milling Machines will be found in our catalogue, which will be sent on request.

KEARNEY & TRECKER CO. MILWAUKEE, WIS. U.S.A.





Ball Bearing Mounting for Heavy Duty Worm Drive

This illustration shows our standard mounting for heavy duty worm drives where possibility of expansion of the worm makes it inadvisable to use two radio-thrust bearings at opposite ends of the worm. With the mounting shown above all the thrust in both directions is carried by the duplex bearing at the left. The radial bearing at the right of the worm is mounted floating. This type of mounting is used in heavy trucks, tractors and other heavy duty installations. The worm wheel is mounted on two radio-thrust bearings which should be placed so that the thrust will be taken as indicated and not in the opposite direction which might appear to be a more obvious mounting. We insist upon this mounting as this insures that any twisting movement due to the worm will be transmitted to the bearings in a direction parallel to the line of contact thru races and balls. With the other mounting this twisting moment would have a tendency to cramp the bearing. In special cases where the distance between the two worm wheel bearings is very considerable the other mounting is sometimes permissible, but such mounting should not be adopted without the approval of our Engineers.

The simplicity and compactness of this layout, and the highly efficient operation of the duplex bearing at speeds which would be almost prohibitive for plain thrust bearings, are features which will appeal to all engineers who design machinery in which worm drives are used.

Gurney Ball Bearing Co.
Conrad Patent Licensee
Jamestown, N. Y. 324

GURNEY

PRODU GISH

Link up GISHOLT with

With GISHOLT Standard Turret Lathes

When you purchase a Gisholt Turret Lathe you are really purchasing *production capacity.*

That this production capacity is high and that it is dependable is assured by the organization which stands behind the machine.

Gisholt Lathes will accomplish all that they are represented to do. Send for the new Lathe Catalog. It will show you what Gisholt Lathes are doing and what they will do for you.

GISHOLT MACHINE COMPANY, 1165 East

Builders of Standard and Automatic Turret Lathes, Vertical and Horizontal

Eastern Sales Office: 30 Church Street, New York

Agents—Swind Machinery Co., Philadelphia. Ogden R. Adams, Rochester; Co., Indianapolis; Stocker-Rumely-Wachs Co., Chicago; Colcord Wright Fred. Ward & Son, San Francisco; Perine Machinery Co., Seattle; Portland Morse Co., Canada.

CTION

HOLT

Production in Your Shop

With GISHOLT Tool Grinders

Production is also a matter of *men* as well as *machines*. Every care should be taken to provide against a man losing time and to insure that his time is profitably spent at his machine producing.

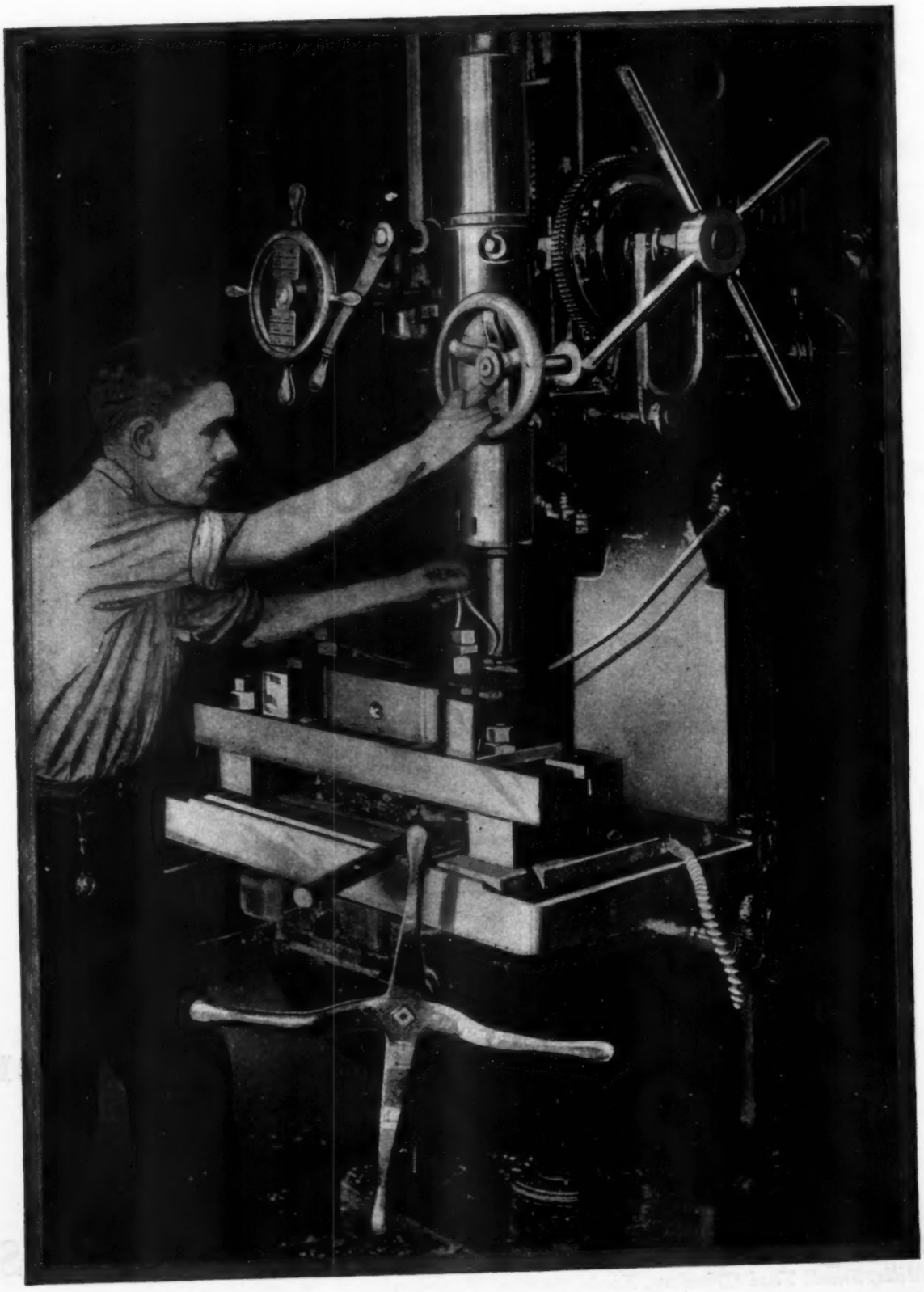
Right here is where the Gisholt Tool Grinder comes in. Any boy or handy man can grind all the cutting tools for your plant and thus release your skilled operators for their real job. The Gisholt Tool Grinder Book tells how you can link up Gisholt Production in your shop. May we send you a copy?

Washington Avenue, MADISON, WIS., U. S. A.

Boring Mills, Small Tool Grinders, Tools, Special Machinery

Works: Madison, Wis., Warren, Pa.

J. L. Osgood, Buffalo; Chas. A. Strelinger Co., Detroit; Vonnegut Machinery Machy. & Supply Co., St. Louis; Smith-Booth-Usher Co., Los Angeles; Machinery Co., Portland; P. H. McArdle, New Orleans; Canadian Fairbanks-



COLBURN
HEAVY DUTY
DRILL PRESS
in the Porter Locomotive Plant

Cast Steel Cross Heads for Porter Locomotives are being drilled, faced, reamed and counterbored on this "Colburn" in the plant of the H. K. Porter Co., Pittsburgh, Pa.

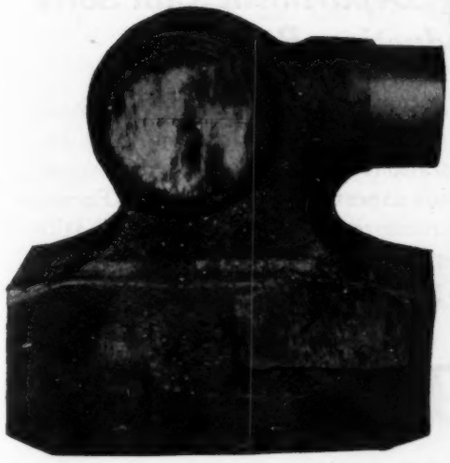
Perhaps you are not familiar with Porter standards in locomotive building. Perhaps you do not know that half of the Porter Locomotives go to old customers. Fifty-two years have proved that Porter Locomotives are good from start to finish, and we take pride in the fact that Colburn Drill Presses are taking an important part.

The Cast Steel Cross Head on which this Colburn is working is shown "before and after." Sixteen of these are turned out every 9-hour day — drilled, faced, counterbored and reamed.

We should like to show you the producing powers of the "Colburn" on **your** work, both quantity and quality. Why not send us blue prints—just as a starter.

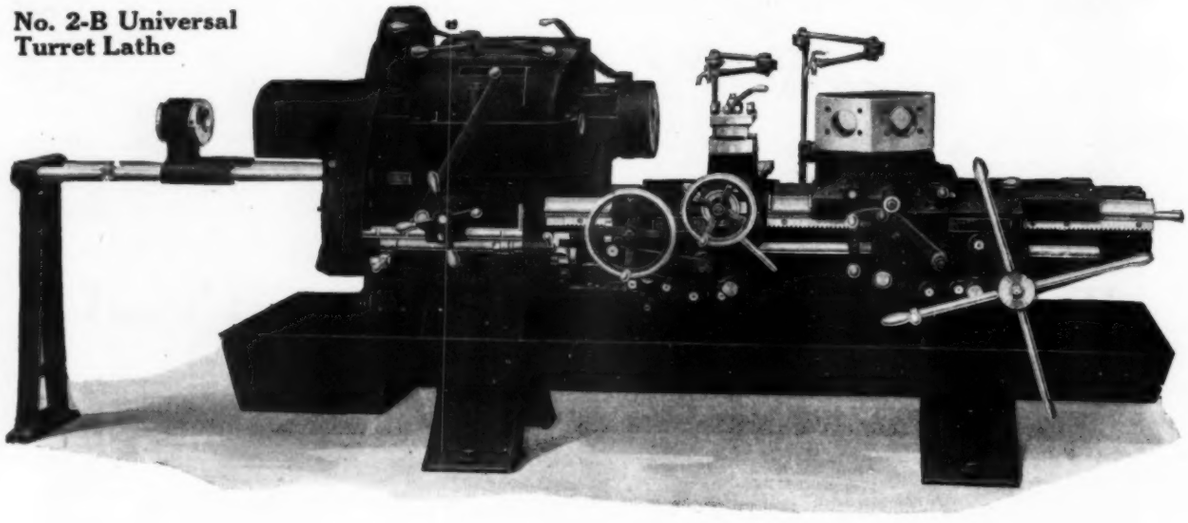
Colburn Machine Tool Co., Franklin, Pa.

Builders Also of Colburn Boring and Turning Mills



Some Reasons for

No. 2-B Universal Turret Lathe



Specially Designed for High Production and Accurate Work

The wonderful record established by the Foster No. 2-B Universal Turret Lathe as a big producer on the most accurate work is due primarily to its special design, the extreme care taken in machining and assembling every part, and its many exclusive features.

The quick traverse on the turret slide, automatic release of the turnstile, improved automatic stop mechanism, etc., are exclusive features that immediately commend themselves to every production man.

The large capacity of this machine and its ability to cover such a wide range of work should receive special consideration. It has a bar capacity of 3¼ in. Turret travel is 30 in. Chucking work as large as 13 in. diameter may be machined. Work up to 20 in. diameter can clear the carriage. Complete specifications are given in our Bulletin—you ought to have it for ready reference.

THE FOSTER LINE

No. 1-B UNIVERSAL TURRET LATHE
Bar Cap. 2" Swing over Carriage, 14" over Cross Slide, 8"

No. 2-B UNIVERSAL TURRET LATHE
Bar Cap. 3¼" Swing over Carriage, 20" over Cross Slide, 13½"

No. 0 PLAIN HEAD SCREW MACHINE
Bar Cap. ⅜" 10" Swing

No. 1 PLAIN HEAD SCREW MACHINE
Bar Cap. ⅝" 11" Swing

No. 2 PLAIN AND FRICTION HEAD SCREW MACHINES
Bar Cap. 1⅛" 13" Swing

No. 3 PLAIN, FRICTION AND ALL GEARED HEAD SCREW MACHINES
Bar Cap. 1⅝" 14½" Swing

No. 4 FRICTION HEAD SCREW MACHINE
Bar Cap. 1⅞" 17¼" Swing

No. 5 FRICTION AND ALL GEARED HEAD SCREW MACHINES
Bar Cap. 1⅜" 17¼" Swing

Nos. 6, 7, & 9, 10 FRICTION HEAD SCREW MACHINES
Bar Cap. 2⅛"; 2⅜"; 2⅝"; 2⅞"; 3⅛" resp. 20" Swing

No. 2 FRICTION HEAD UNIVERSAL TURRET LATHE
Bar Cap. 1⅛" 14" Swing

No. 2 FRICTION SET-OVER TURRET LATHE
Bar Cap. 1⅛" 14" Swing

No. 3 FRICTION HEAD UNIVERSAL TURRET LATHE
Bar Cap. 1⅝" 16" Swing

No. 3 FRICTION HEAD SET-OVER TURRET LATHE
Bar Cap. 1⅝" 16" Swing

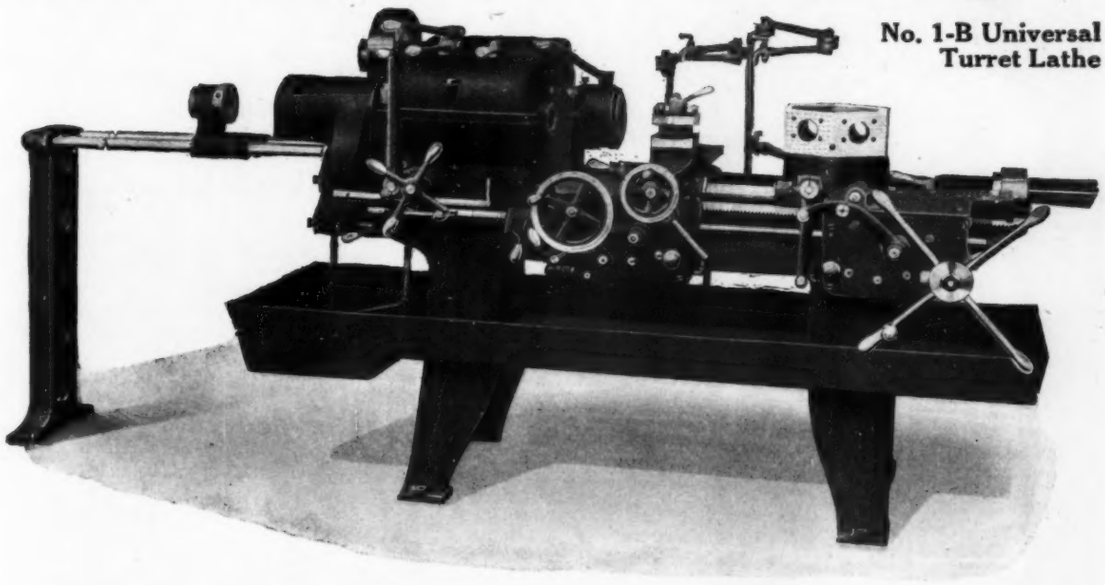
THREAD MILLERS
Manufactured under the Holden & Morgan Patents

Our Engineering Department Can Solve Your Production Problems

Our large expert staff of Engineers is always at the command of those who are dissatisfied with present production. The proper tooling and sequence of operations for obtaining maximum output is a problem for the production expert to solve properly. These men are in position not only to recommend the proper combination of tools but when work requires it they design special tools for unusual operations. Write us about your problems.

FOSTER MACHINE

Foster Leadership—



No. 1-B Universal Turret Lathe

Equally Good for Long Production Jobs or Hustling Through Parts

The equipment of standard tools and attachments which can be furnished with the Foster No. 1-B Universal Turret Lathe is unusually complete and extensive. Either for manufacturing in large quantities or for handling a great variety of parts in small quantities this machine performs its work in the best, quickest and cheapest way.

Both bar and chucking work can be handled with equal facility. Its range extends from wide forming work in steel to turning hard cast iron of the largest diameter that can be held in the three jaw chuck.

The advantage of two tool-carrying units working simultaneously manifests itself on high production work.

Maximum Production of Threading on Parts in Large Quantities

The H & M Thread Millers have been adopted universally by engineers as the most rapid and accurate means of producing threads in all metals—the threads being so near perfect they can truly be called absolute.

The manufacture of ammunition has been revolutionized by the development of these machines. They cut both internal and external threads of any pitch or design for the smallest fuse or the largest steel shell. The rigid Government inspection has no terrors for H & M threading work. Install H & M Thread Millers in your plant and stop your worry. We have a Bulletin that gives further details.

No. 1
H & M Thread
Miller

COMPANY, Elkhart, Ind.

She Likes to Do This

Are you introducing women into your shop? The Cincinnati Gear Cutter brings results so regularly and so easily that a woman operator can maintain the highest accuracy and production.

Here is the record of this girl, cutting cone gears for quick change boxes on Greaves-Klusman Lathes. Fifty gears, 56 teeth each, are the daily output. The gears are thirty point machinery steel, 7.33 inch diameter and 8 diametral pitch.

Cincinnati Gear Cutters are manufactured in sizes to handle gears up to 72-in. in diameter and 20-in. face.

The Cincinnati Gear Cutting Machine Co.

Subsidiary of Cincinnati Shaper Co.

Cincinnati, Ohio

Ohio Grinders

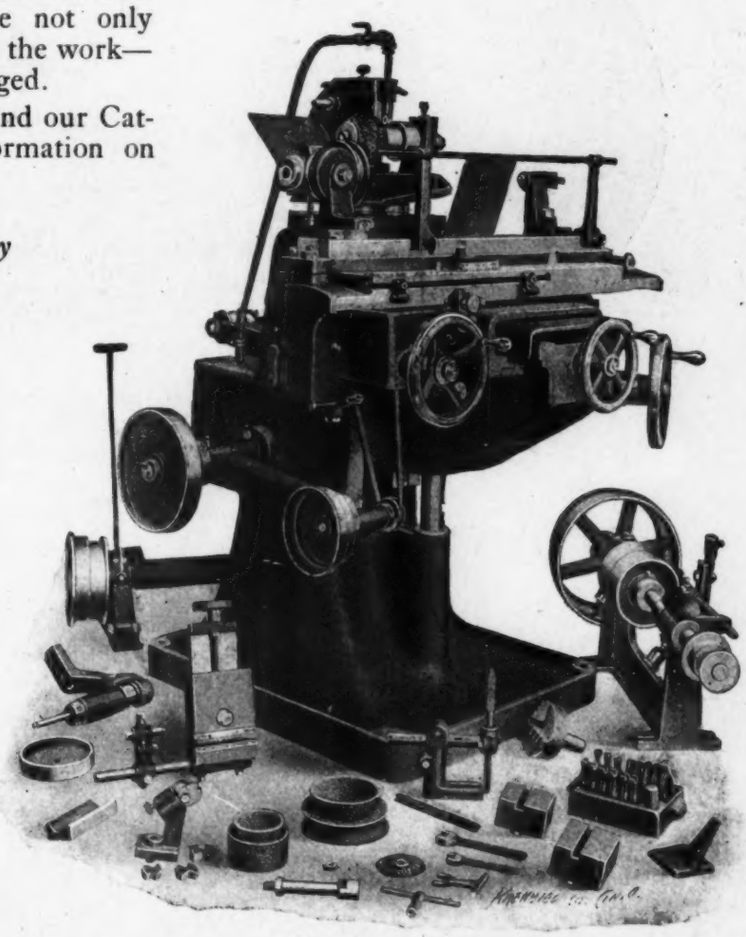
will grind properly every cutting tool used in machine shop work.

For grinding milling cutters, gear cutters, reamers, gages, shafts, bushings—external and internal, and all similar work the Ohio is superior for accuracy, ease of operation and volume of output.

The correct grinding of cutting tools is an important item in the cost of production. The dull tool or the improperly ground one not only wastes time, but it ruins the tool and the work—and frequently the machine is damaged.

We've been over 20 years "at it"—and our Catalog contains much valuable information on modern grinding.

Write today for your copy of our book



The Oesterlein Machine Company

Manufacturers of Millers and Grinders

Cincinnati, Ohio

MILLERS OHIO GRINDERS

"Tools In Which Every Ounce Works"

PEACE WILL MEAN

HYATT ROLLER BEARING HANGERS

CONTINUED PROSPERITY

The event for which American Industries have confidently yet anxiously waited, since the first drop of American blood was spilled and the first American dollar spent to forever establish the freedom and peace of the world has arrived. The war has been won and as President Wilson told the Congress, "Everything for which America fought has been accomplished."

The War Industries Board is carefully but surely clearing the road so that the industries of our country can take up, unhampered, their pre-war activities and carry them through with the knowledge gained in war times to an economic, fundamentally sound success, never known before.

In the adequate reconstruction of a war-torn world the United States will be called upon for the production of peace materials as greatly and as steadily as it was for the production of war materials.

The United States must provide for years to come:

1. **Steel** and the other industrial metals for their thousand important uses.
2. **Coal** in greater amount than ever before.
3. **Ships** to hold for us the place in foreign trade which the importance of our country merits.
4. **Food** and clothing for the weakened, war-shocked peoples of Europe.
5. **American Machinery** to replace machinery ruined by the demands of munition manufacture. American machinery to re-establish the crippled industries of our Allies.

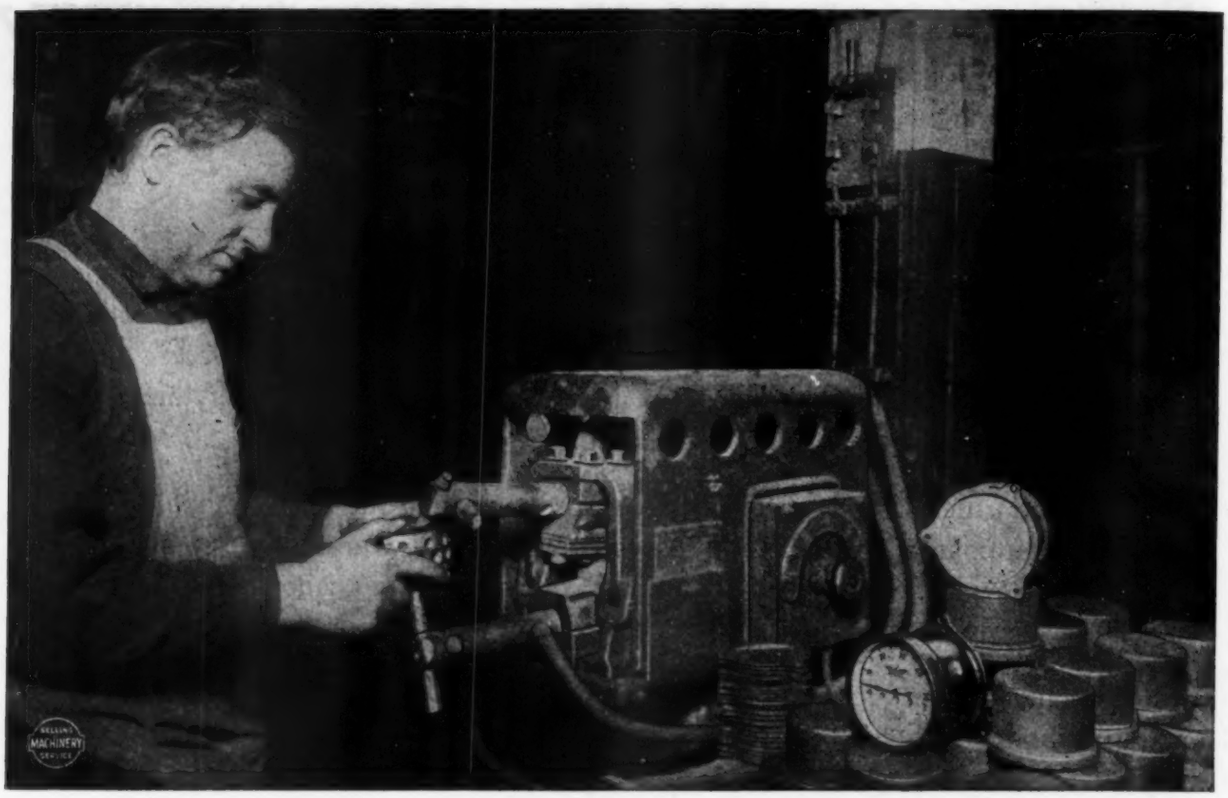
The ideals established by the combined Victory of the enlighteded nations of the earth will surely lead to Peace, Happiness and Prosperity for the whole world.

The Hyatt Roller Bearing Company feels that the ensuing years will be the most prosperous years in the history of the United States.

HYATT ROLLER BEARING COMPANY
Metropolitan Tower, New York

A-139

HYATT ROLLER BEARING HANGERS



Even Speedometers are in the Range of Thomson Spot Welders

Indeed, speedometer cases are *easy* for the Thomson. And so are thermometer case backs. In this particular case it's a speedometer—4 spot welds in each case and 120 cases welded every hour at a cost of about 5c per hour for current.

Rapid, you will admit. And cheap enough, too. Yes, and ***stronger*** than it could be by any other process. The Thomson Process of Spot Welding is not a one-feature affair. Behind it is an engineering service that applies electric spot welding to each individual piece of work in a way that brings 100 per cent efficiency from *every* standpoint. *Your* work is probably in the Thomson range, too. Why not send us blue prints or samples and see. No obligations. Bulletin SA-1 describes our full line of similar light duty spot welders.

Thomson Process
Electric Welding

THOMSON SPOT WELDER COMPANY

LYNN, M

84 State St., Boston, Mass.

600 Widener Bldg., Phila., Pa.
841 Engineers Bldg., Cleveland, Ohio

3 Wood St., Pittsburgh, Pa.

Butt Welding Pipe Coils for 23 years—

and still going strong.

A double significance is attached to this service. It means that Thomson Butt Welders are at once right in principle and strong in service. Twenty-three years of almost constant service, welding 20 foot lengths of 1½ inch heavy steel pipe into continuous coils at an average speed of two welds a minute and an approximate cost of 6/10 of a cent per weld for current used. That is the record of this Thomson Butt Welder. The fact that it is still doing the work on a profitable basis is proof that the Thomson Process is developed from a ***sound*** basis

Let us show you to what high point the modern Thomson Process has been developed and how profitably Thomson Engineering Service can apply electric welding to your work. *Ask for Bulletin BB-1.*

Thomson Process
Electric Welding

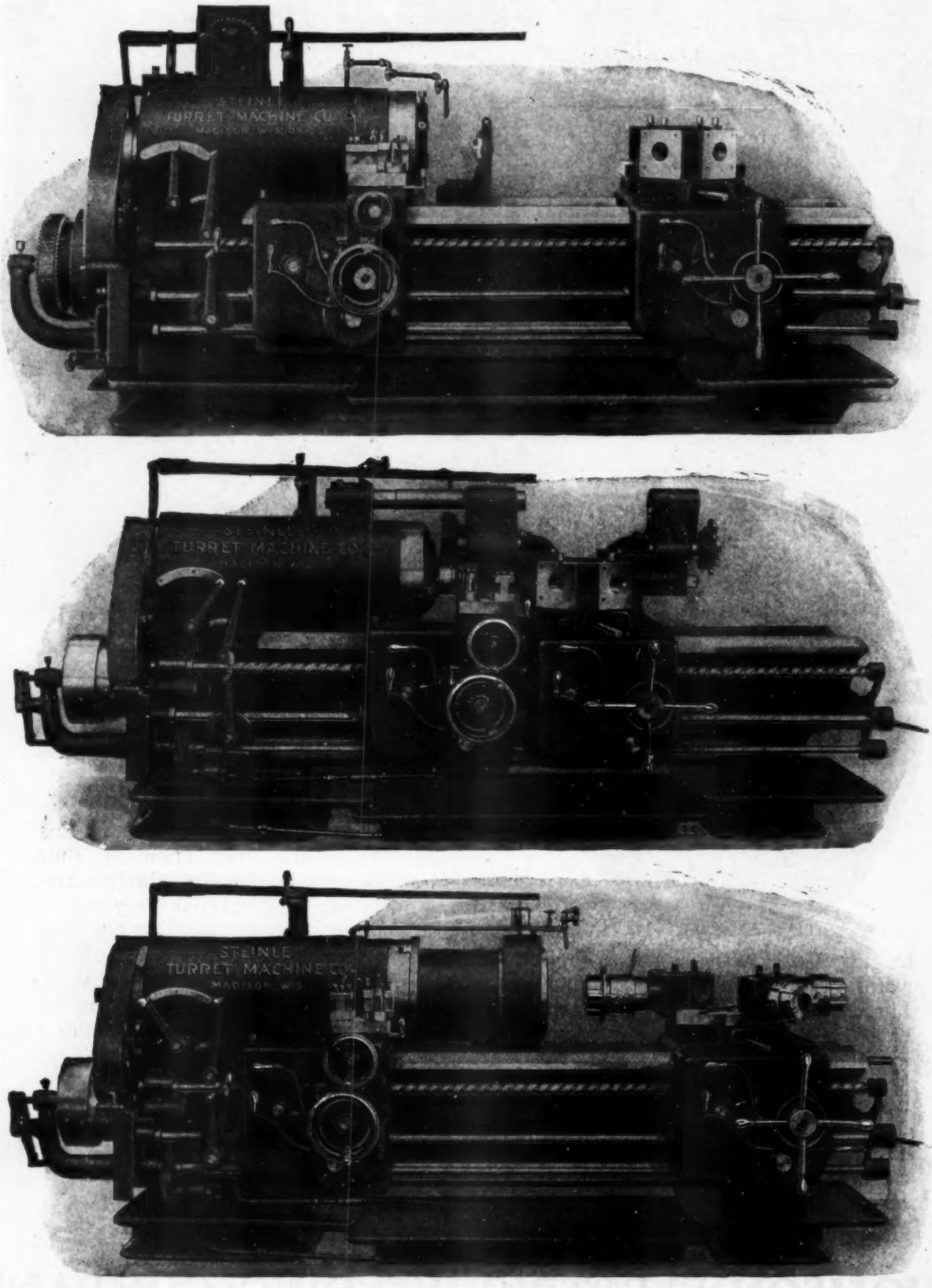
THOMSON ELECTRIC WELDING COMPANY

MASS., U. S. A.

4100 Langland St., Cincinnati, O.

323 North Sheldon St., Chicago, Ill.

1127 Majestic Bldg., Detroit, Mich.

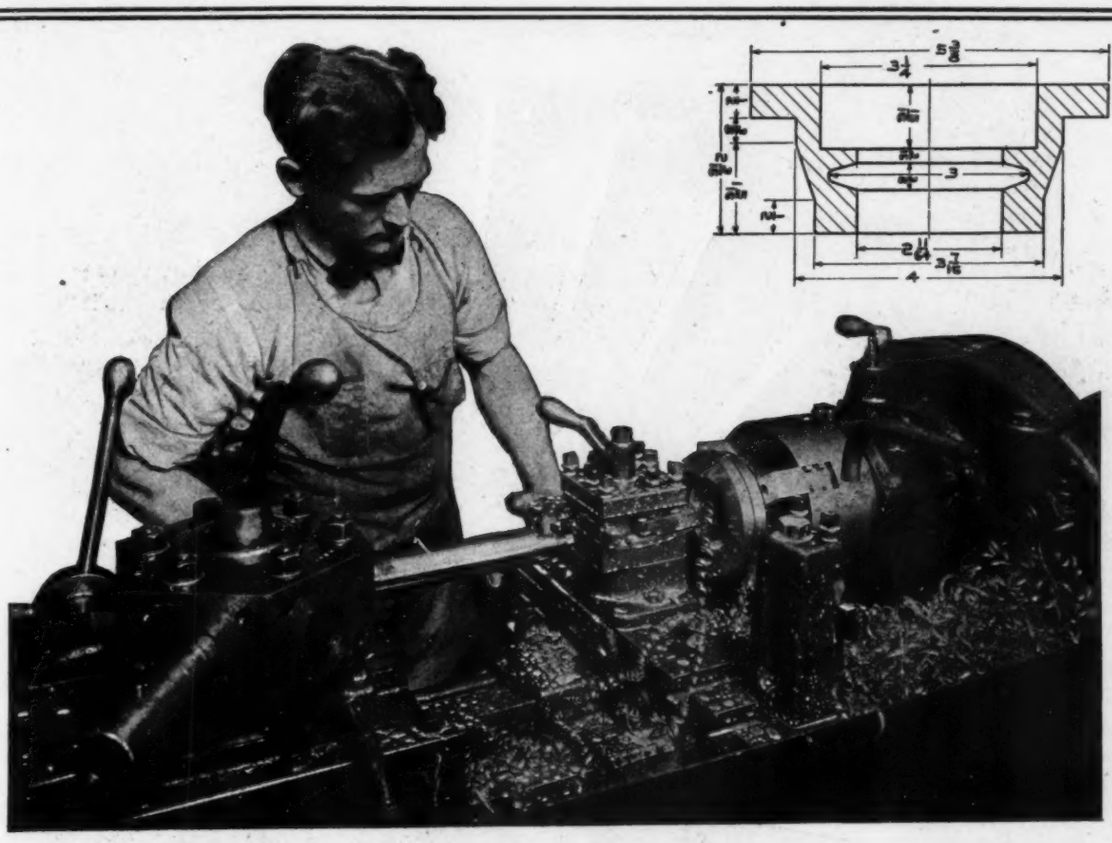


WRITE FOR INFORMATION

STEINLE TURRET MACHINE COMPANY

Madison, Wisconsin, U. S. A.

Eastern representative: Machine Tool Engineering Company, Singer Bldg., 149 Broadway, New York City. Detroit representative: Cadillac Tool Company, Dodge-Power Building, 268 Jefferson Avenue, Detroit, Michigan. Pacific Coast representative: L. G. Henes, Monadnock Building, San Francisco, Title Insurance Building, Los Angeles.



Value of the Square Turret

THIS shows the amount of material removed and how well the many operations on these tough power sprocket clutches were finished on the No. 4 Universal Screw Machine. The hexagon turret was used only for boring. The square turret, loaded to capacity with cutters, did the rest with the aid of its eight power cross and longitudinal feeds.

For Work Too Complicated for Ordinary Screw Machines

The special features of the No. 4 Universal (in this case the unusual use for the square turret) adapt them to a wide range of work too complicated for ordinary screw machines or turret lathes.

SEND FOR DETAILS

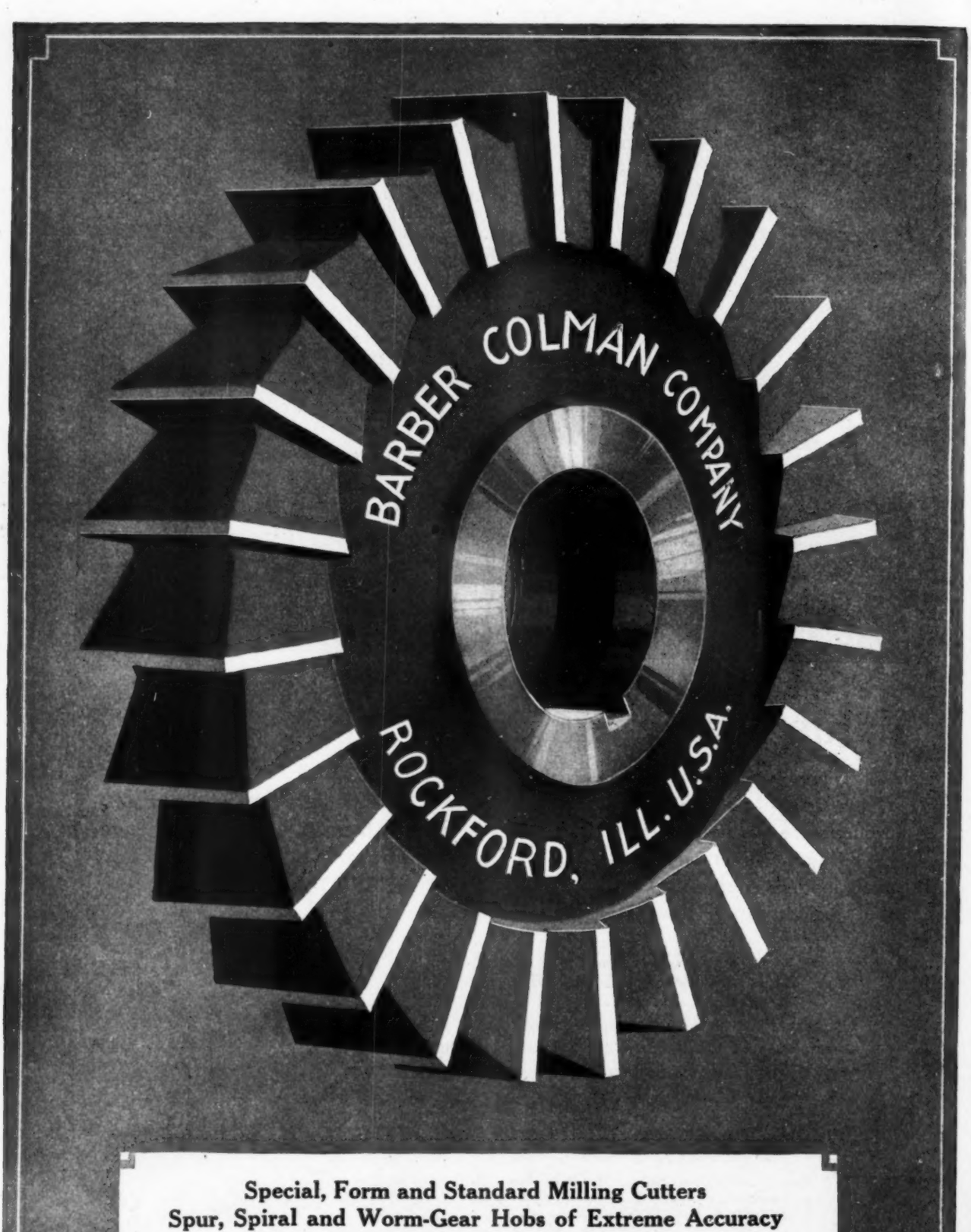
Turret Lathes and Screw Machines from ⅝ in. x 4 in. to 4½ in. x 44 in., Maximum Swing 21½ in.

THE WARNER & SWASEY COMPANY

CLEVELAND, OHIO, U. S. A.

NEW YORK Office—Singer Building. **Boston Office**—Oliver Building. **Buffalo Office**—Iroquois Building.
Detroit Office—Ford Building. **Chicago Office and Show Rooms**—618-622 Washington Blvd.

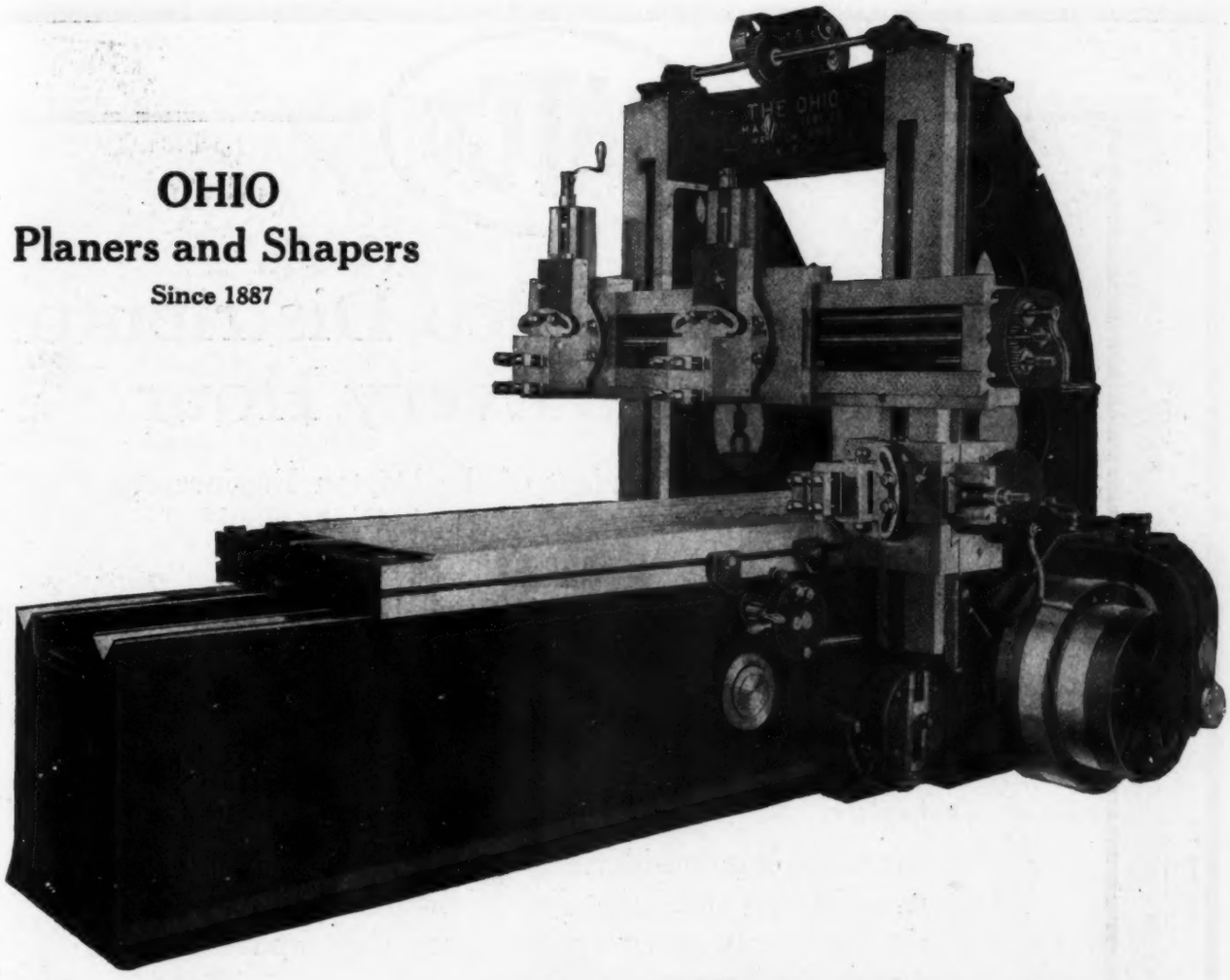
FOREIGN AGENTS: Chas. Churchill & Co., Ltd., London, Birmingham, Manchester, Newcastle-on-Tyne and Glasgow. Allied Machinery Company, Paris and Turin. Van Rietschoten & Houwens, Rotterdam. Yamatake & Co., Tokio. Benson Brothers, Sydney and Melbourne. A. Asher Smith, Sydney. A. R. Williams Machinery Co., Ltd., Toronto, St. John, Winnipeg and Vancouver. Williams & Wilson, Ltd., Montreal.



Special, Form and Standard Milling Cutters
Spur, Spiral and Worm-Gear Hobs of Extreme Accuracy

Barber-Colman Company
Rockford, Ill., U. S. A.

OHIO
Planers and Shapers
Since 1887



A Man and His Machine

In the proper machining of planer work much depends upon the efficiency of both the man and the machine.

The function of a good Heavy-Duty Planer is to machine accurately—and as rapidly as the nature of the work will permit—any size or shape piece that may be presented.

The function of the operator is to so adjust the work and the machine as to attain the maximum cutting efficiency. This cannot be accomplished even by the most skilled operator unless the planer is properly equipped for such work. Many planers are not designed to handle the large—the unusual—jobs with speed and accuracy.

You can't afford to handicap your shop production. Let us tell you what the Ohio is doing in the best shops of the country on heavy-duty work.

THE OHIO MACHINE TOOL CO.

Leighton Street, Kenton, Ohio

DOMESTIC AND FOREIGN AGENCIES:

Chicago, Federal Machinery Sales Co.; Toledo, Coghlin Machinery & Supply Co.; Cleveland, W. M. Pattison Supply Co.; Detroit, English-Miller Machinery Co.; Pittsburgh, Laughlin-Barney Machinery Co.; Buffalo, Laird Machinery Co.; Syracuse, H. A. Smith Machinery Co.; New York, Garvin Machinery Co.; Providence, Brownell Machinery Co.; Hartford, Conn., Purinton & Smith; Boston, Factory & Mills Supply Co.; Huntington, W. Va., Banks Supply Co.; Omaha, Neb., Sunderland Machinery & Supply Co.; Montreal, Que., Standard Mchry. & Supplies Co.; Grand Rapids, Mich., McMullen Mchry. Co.; New Orleans, La., P. H. McArdle; Philadelphia and Baltimore, Monarch Machine Co.; Los Angeles, Shaw, Palmer, Bakewell Co.; St. Louis, Mo., Colcord-Wright Machinery Supply Co.; Tacoma, Wash., Sterling Machinery Co.; Portland, Ore., Pacific Engineering & Equipment Co.; San Francisco, Cal., General Machinery & Supply Co.; Gaston, Williams, Wigmore, France, England, Japan, China, Italy; Stokvis-Zonen, Petrograd.

NATCO

Drilling 63 Delco Distributor Housings Every Hour

A trip through the plant of the Dayton Engineering Laboratories Company, of Dayton, Ohio, would show you a number of interesting NATCO performances.

One of them is the work of this "Baby NATCO," shown on the opposite page. Seven holes drilled into sixty-three of these Cast-Iron Distributor Housings every hour—a total of 441 holes in 60 minutes—may not sound so wonderful. There are many NATCO records that run much higher.

But when it is considered that these holes are drilled into two different sides, that four of them are blind and that the jig must be given a quarter turn, the output takes on a new significance.

The patented multi-speed feature of NATCO Drills—the principle whereby each individual spindle may be operated at an independent speed, makes it possible to drill, ream tap and countersink on the same machine

Let us show you how the NATCO will boost your production.
Send us your blueprints.
No obligations.

The National Automatic Tool Company
Richmond, Indiana, U. S. A.

B630

FARWELL GEAR HOBBERS

Four Sizes and Types
Universal and Plain

The following features of Farwell Gear Hobbers should appeal to those progressive manufacturers who are interested in producing mechanically perfect gears in quantities or otherwise, at a minimum cost.

The HEAD may be swiveled to any position in the entire circle. Frequently it must be swiveled 130 degrees from the spur gear cutting position. Many hobbers on the market can only be swiveled 50 degrees which makes them unfit for cutting acute angle spirals, or worms, or to cut spirals of both angles with the same hob.

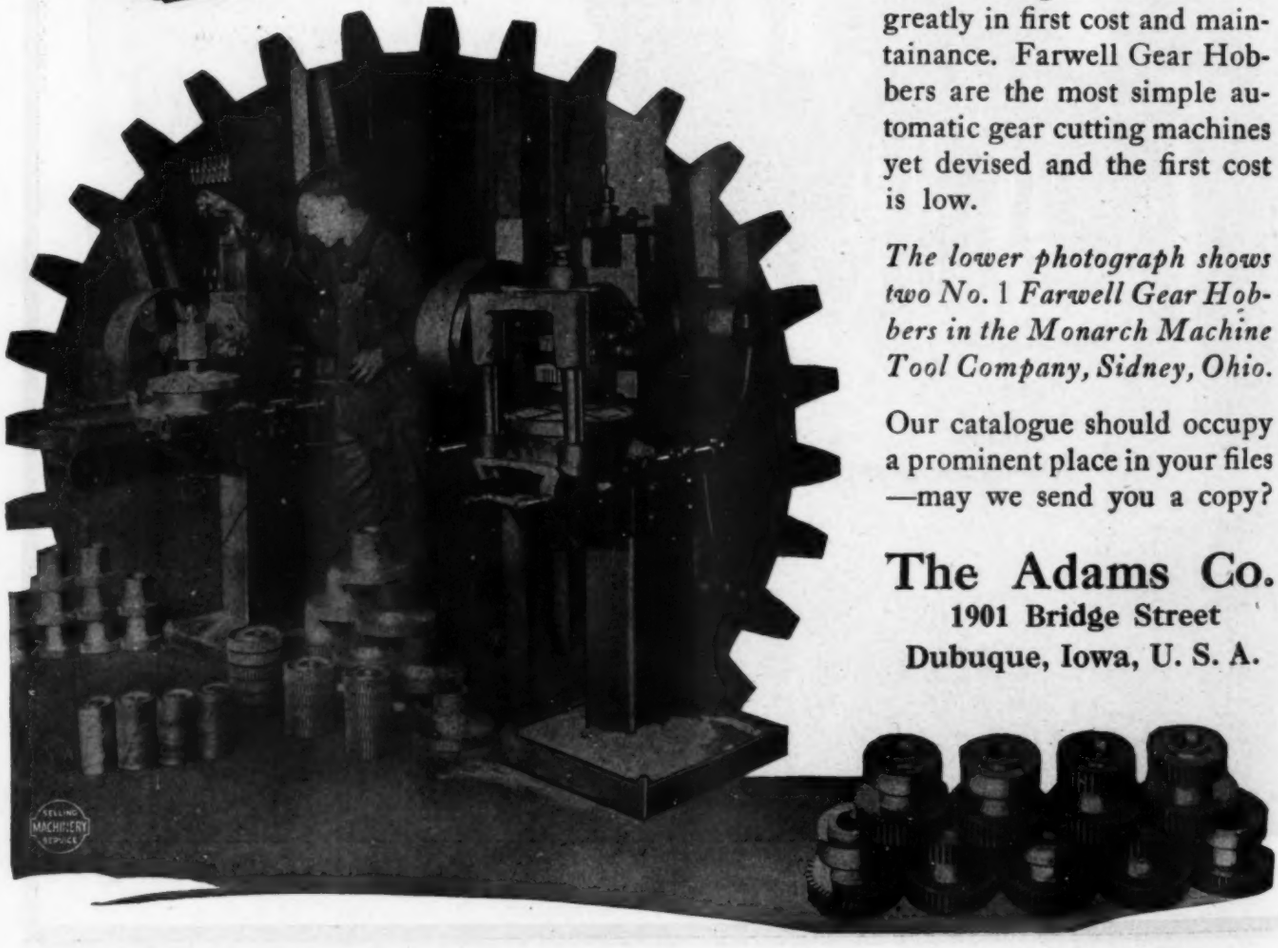
Right and left hand spirals of both pinion and gear can be cut with the same hob.

The setting of the hob spindle for cutting gears is made so simple by the use of a gauge, that a boy or girl operator can set the machine for cutting spur gears with assurance of accuracy.

Gear cutting machines differ greatly in first cost and maintainance. Farwell Gear Hobbers are the most simple automatic gear cutting machines yet devised and the first cost is low.

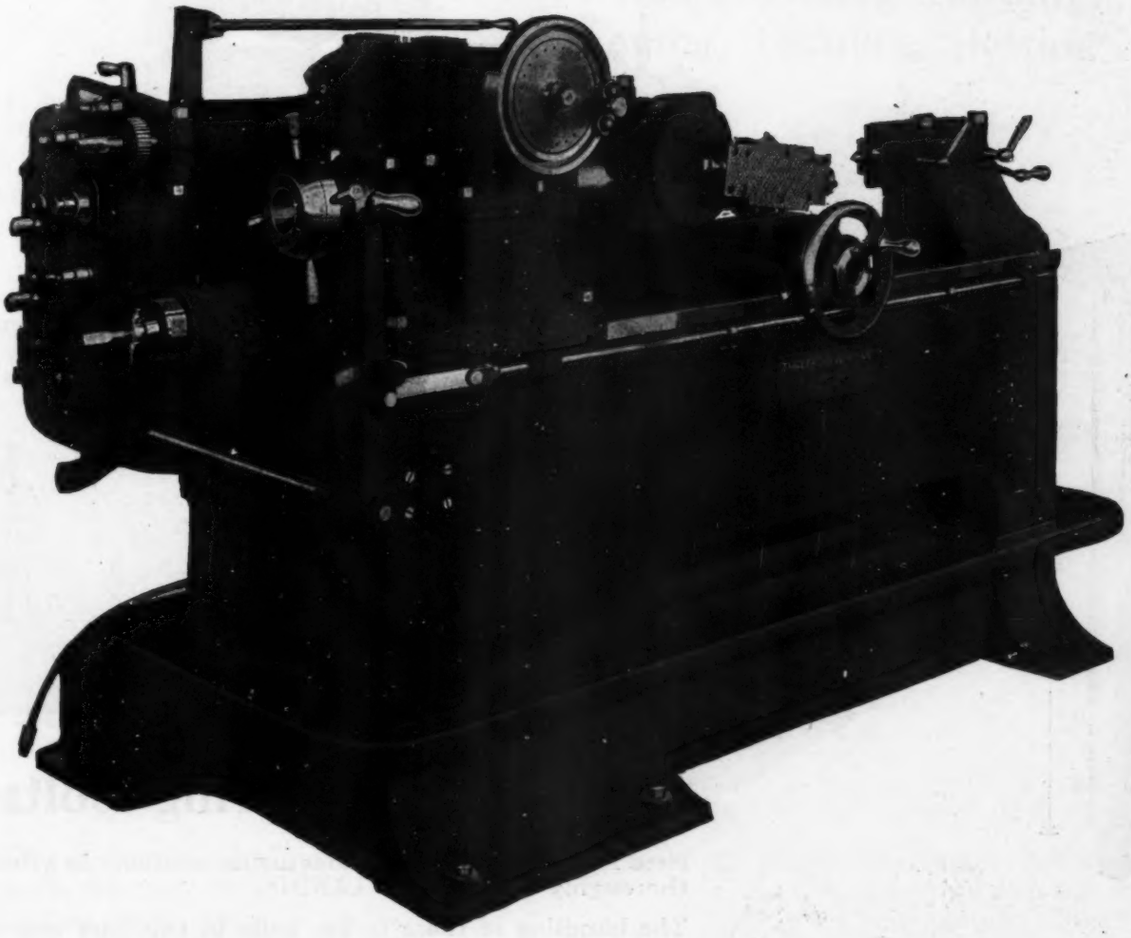
The lower photograph shows two No. 1 Farwell Gear Hobbers in the Monarch Machine Tool Company, Sidney, Ohio.

Our catalogue should occupy a prominent place in your files —may we send you a copy?

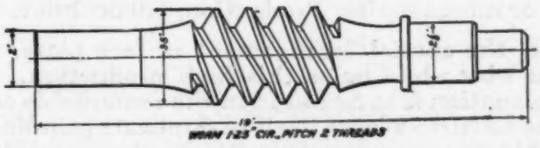


The Adams Co.
1901 Bridge Street
Dubuque, Iowa, U. S. A.

LEES-BRADNER
Thread Milling Machine



"Worm for Tractor Worm Drive"



Lees-Bradner Thread Millers are cutting worms of this character in many plants.

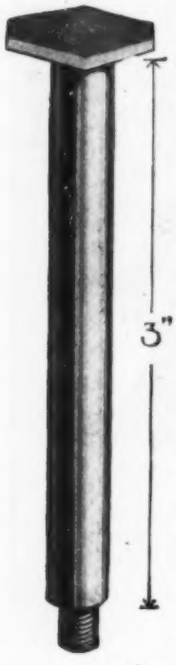
Refer your thread cutting problems to our Engineering Department who will give you the benefit of their long experience.

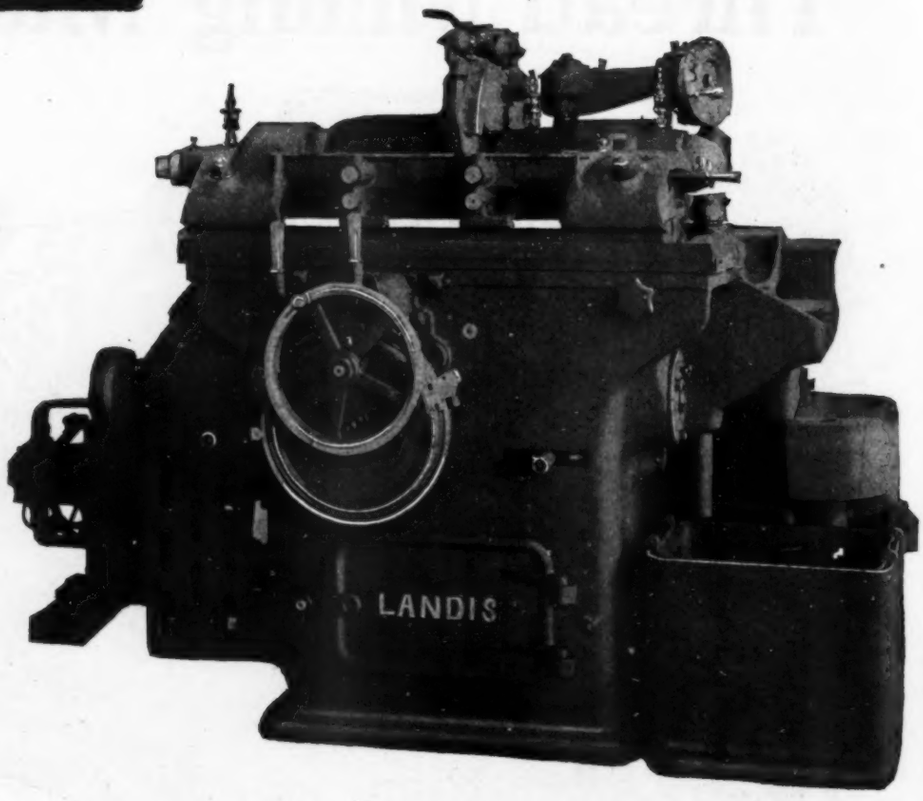
The Lees-Bradner Company, Cleveland, U.S.A.

Thread Millers ***Gear Generators***

Half a minute on the

LANDIS 6x18 Grinding Machine





Fast time on spring bolts—

Here is an example of manufacturing economy in grinding, thoroughly typical of the LANDIS.

The handling of these spring bolts in this case was expedited by the use of a hexagon socket in the face plate, in which the hexagon head of the bolt was fitted. The use of a 3-inch wide wheel made traversing of the wheel carriage unnecessary. An average of .020 stock was removed, within .001 plus or minus limits. Production, 120 per hour.

Of course, the special arrangement of face plate, and the use of the wide wheel helps this high production. But the main explanation is to be found in the remarkable ease with which the LANDIS adapts itself to duplicate grinding operations within its range, coupled with the elemental simplicity of control. In the LANDIS Design the work table is stationary and wheel travels.

Let us send you the LANDIS Catalog—on your request.

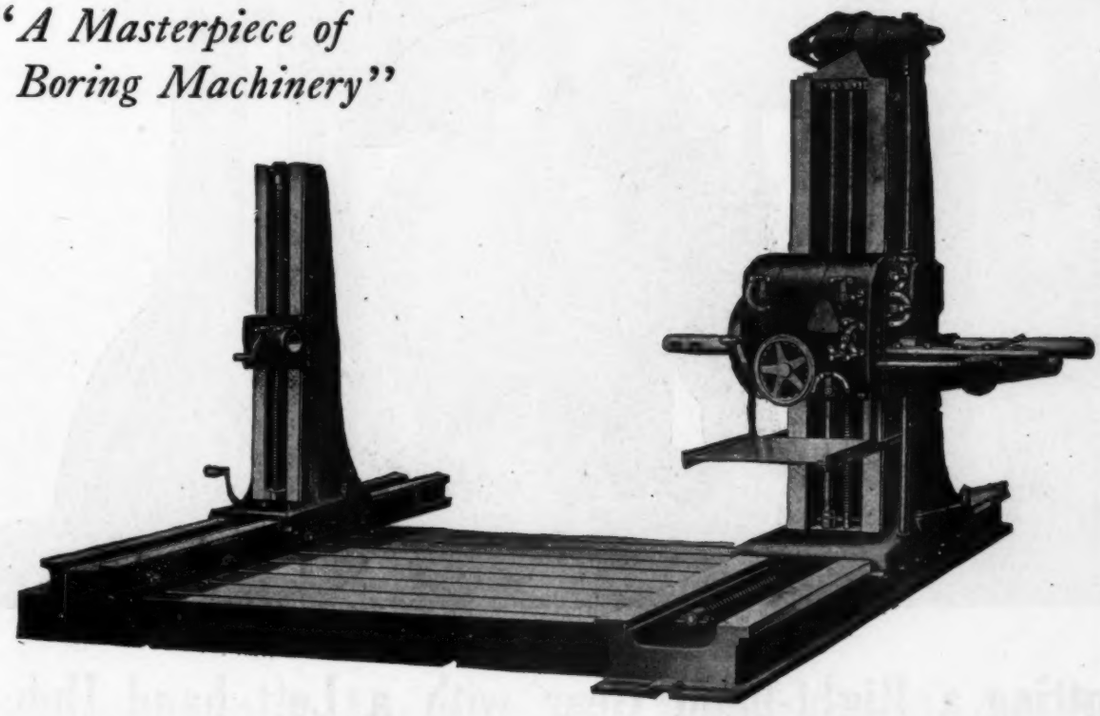
LANDIS TOOL CO., Waynesboro, Pa.

New York Office, 50 Church St. Agents: Dewstoe Machine Co., Birmingham, Ala.; Harron, Rickard & McCone, San Francisco and Los Angeles

For the Heaviest Work

Boring, Drilling, Milling, Tapping, Threading, Facing, Turning, Slotting

"A Masterpiece of Boring Machinery"



This floor-type Horizontal Boring Mill meets the exceptional requirements necessary to cope with the hardest kind of work. It machines accurately those pieces whose shape and size make it impossible to handle on any other type of machine tool.

Any or all operations required to finish the piece may be performed—such as boring, drilling, milling, tapping, threading, facing, turning and slotting. If work permits—and necessary fixtures supplied—all five sides of piece may be machined with but one setting.

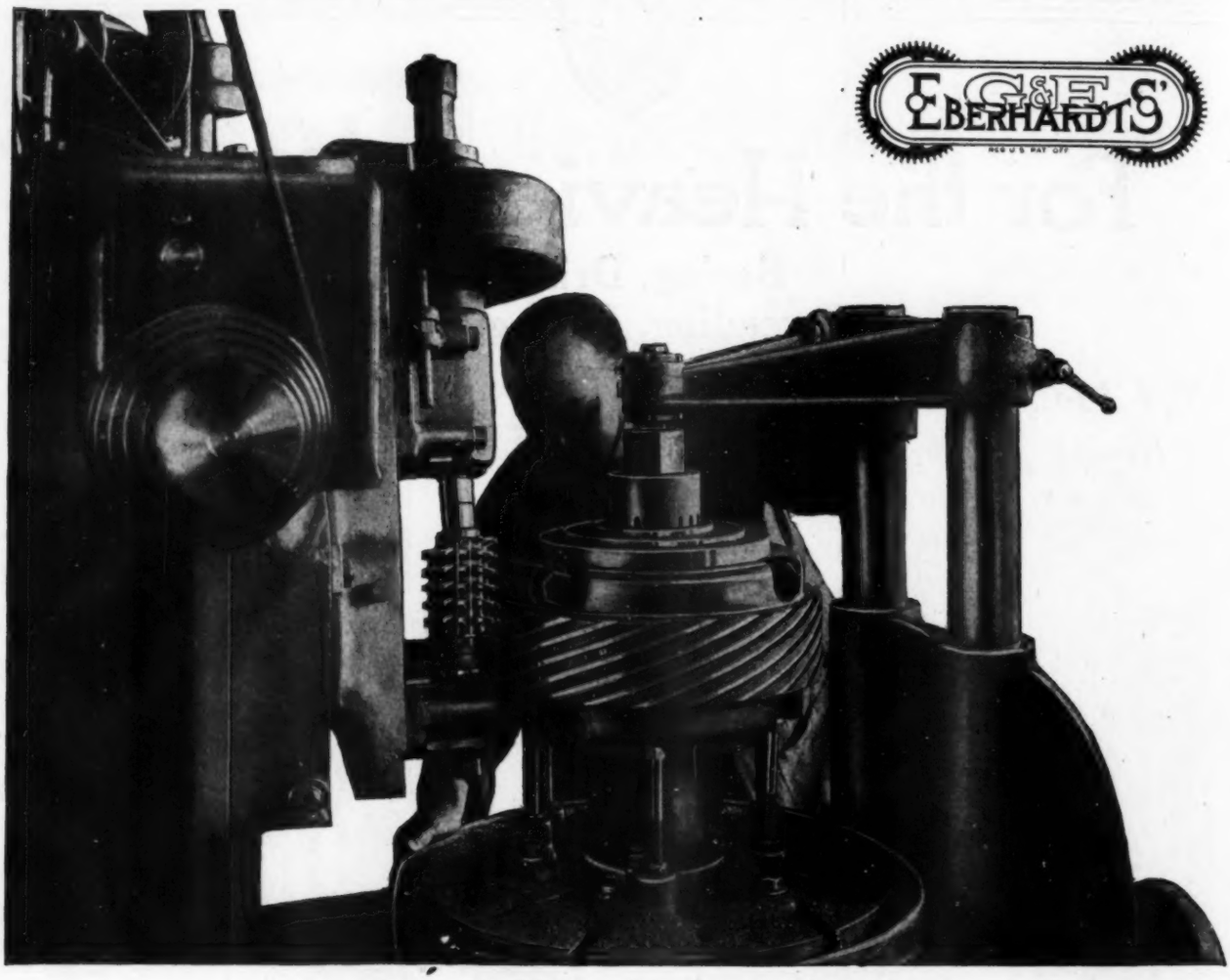
5-inch Spindle Bar. Weight, 50,000 lbs.

Catalog Gives Full Details—Write for it Today

Giddings & Lewis Manufacturing Co., Fond Du Lac, Wis.

Domestic Agents: Taylor Machinery Co., Boston; Fairbanks Company, New York, Albany, New Orleans, Hartford; H. A. Smith Machinery Co., Syracuse; Swind Machinery Co., Philadelphia; Sherritt & Stoer Co. (Virginia territory), Philadelphia; Kemp Machinery Co., Baltimore; Homer Strong, Rochester; Motch & Merryweather Machinery Co., Cleveland, Detroit; E. A. Kinsey Company, Cincinnati, Indianapolis; McMullen Machinery Co., Grand Rapids, Mich.; Stocker-Rumely-Wachs Co., Chicago, Milwaukee; Bowman-Blackman Machine Tool Co., St. Louis; English Tool & Supply Co., Kansas City; Sunderland Machinery & Supply Co., Omaha; Hendrie & Bolthoff Mfg. & Supply Co., Denver; Salt Lake Hardware Co., Salt Lake City; Eccles & Smith Co., San Francisco, Los Angeles, Portland; Vickers & Company, Seattle.

Foreign Agents: Canadian Fairbanks-Morse, Canada; Fenwick Freres & Co., France, Italy, Belgium, Switzerland, Spain, Portugal; Burton-Griffiths & Co., England; Rylander & Asplund, Sweden; Wynmalen & Hausmann, Holland; R. L. Scrutton & Co., Ltd., Australia.



Cutting a Right-hand Gear with a Left-hand Hob. An Unusual Operation, but "G&E" Hobbers Are Unusual

Cutting a 70 deg. right-hand helical gear—especially at such an extreme angle—is a job you don't see every day. But "G & E" Hobbing Machines have unusual flexibility and power; they cut rapidly and accurately spur, helical and worm gears. This special job shown here is not recommended as good practice, but it illustrates the wide range of work any shop can get out of a "G & E" Hobber.

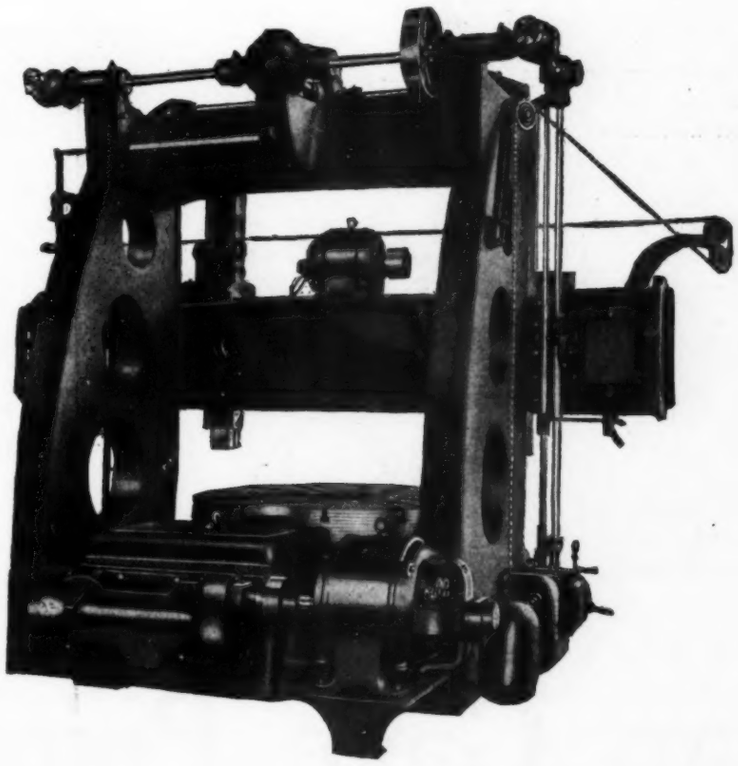
If you cut gears it will pay you to look into this machine. It is made in 18, 36 and 96 inch sizes and for this kind of work is unsurpassed.

Our catalog gives full details. Shall we send it?

GOULD & EBERHARDT

"HIGH DUTY" SHAPERS
AUTOMATIC GEAR AND RACK CUTTING MACHINERY

ESTABLISHED 1833 NEWARK, N.J. U.S.A.



This cut illustrates our 84-in. mill (rear view), as driven by a variable speed direct connected motor, with constant speed motor for overhead works.

BUILDERS OF

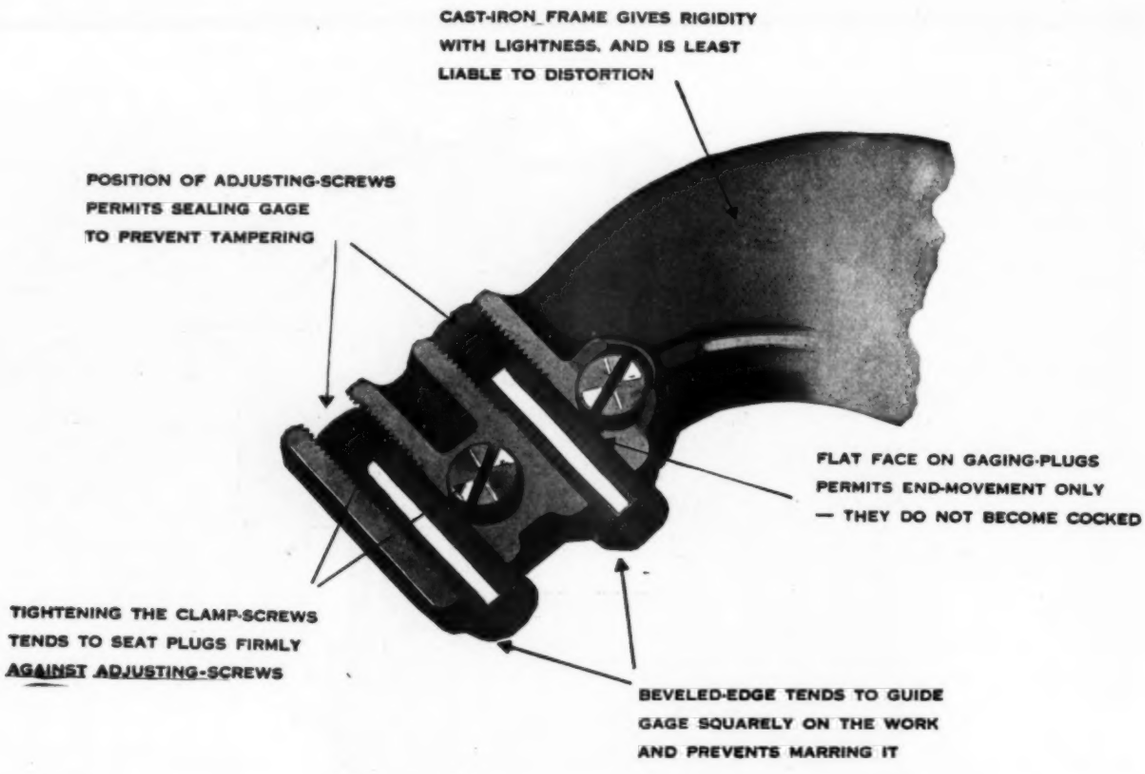
Vertical Boring, Turning and Chucking Machines

Also called Boring Mills

Ranging in Size from 30- to 100-inch Swing.

The King Machine Tool Co.

Winton Place, Cincinnati, Ohio


CAST-IRON FRAME GIVES RIGIDITY WITH LIGHTNESS, AND IS LEAST LIABLE TO DISTORTION
POSITION OF ADJUSTING-SCREWS PERMITS SEALING GAGE TO PREVENT TAMPERING
FLAT FACE ON GAGING-PLUGS PERMITS END-MOVEMENT ONLY — THEY DO NOT BECOME COCKED
TIGHTENING THE CLAMP-SCREWS TENDS TO SEAT PLUGS FIRMLY AGAINST ADJUSTING-SCREWS
BEVELED-EDGE TENDS TO GUIDE GAGE SQUARELY ON THE WORK AND PREVENTS MARRING IT

Snap Gage Pointers

As old 1918 limps off, the thing that is in your mind is 1919. And your 1919 plans probably include the use of the limit system and of limit snap gages.

The limit system proved itself so efficient during the emergency that nobody ever wants to go back to the old "absolute dimension" method of working.

There will probably be ten limit gages used next year where there was one used a short time ago. The fact is, the limit system and limit gages are two of the most important subjects in the mechanical world today.

The illustration above shows what the "insides" of a Johansson Adjustable Limit Snap Gage look like.

The life of a gage like this is indefinite. Given ordinary care, it will probably last for a good many years. Its adjustable feature puts it entirely beyond the limitations of a solid gage. With the aid of a common screw-driver, this gage may be readjusted as often as is necessary — when limits change, when entirely new sizes are wanted, or when wear in the gage itself takes place.

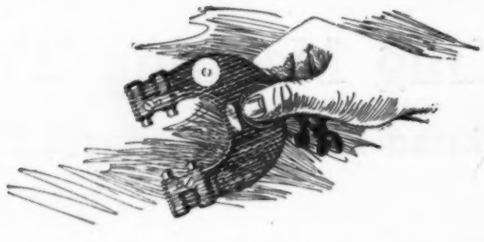
At the signing of the armistice, thousands of solid snap gages promptly became JUNK. This could never have happened if the gages had been adjustable, like the Johansson.

Twenty-one sizes in Johansson Gages give a complete snap gage SYSTEM, covering all possible dimensions up to and including 12 inches.

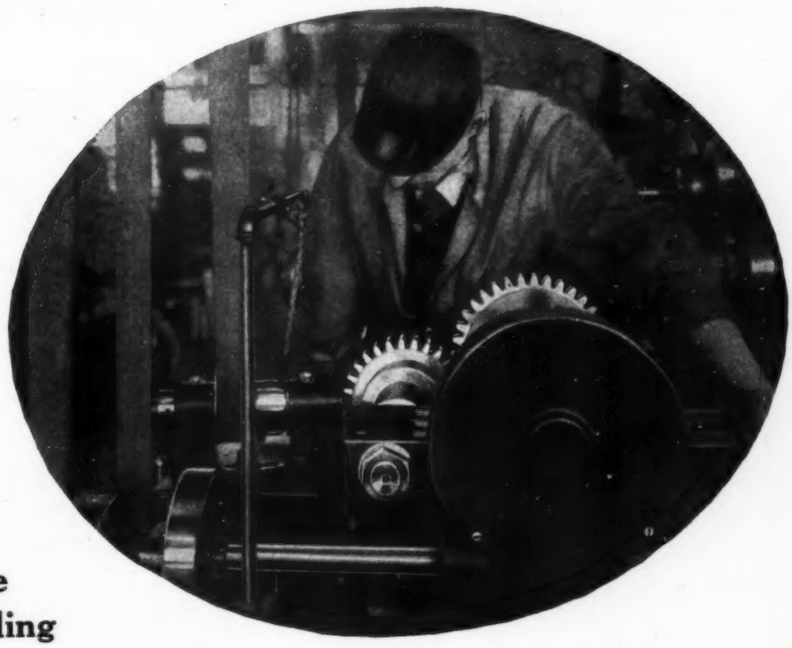
Get your name on our mailing list for our new general catalog.

Swedish Gage Co., 245 West 55th St., New York.

Johansson



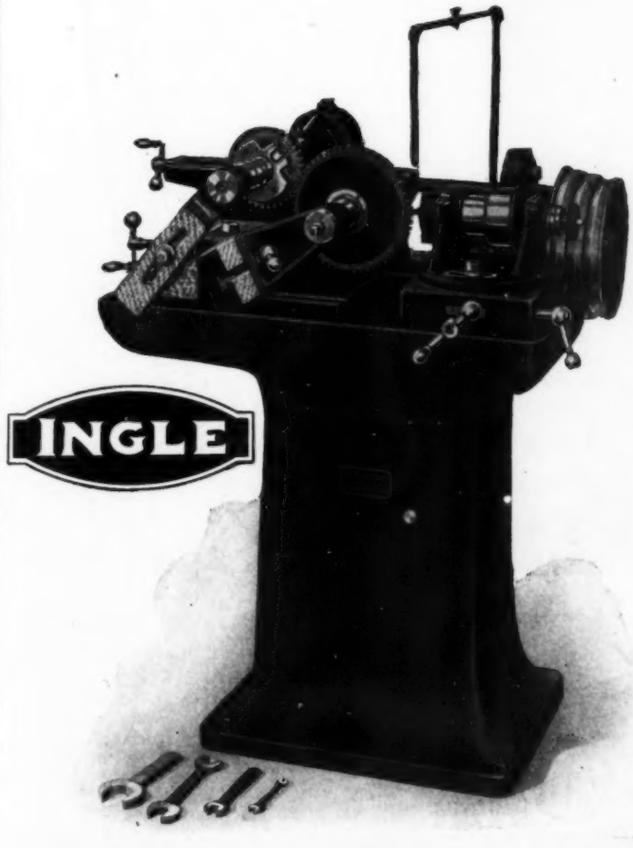
Rochester Automatic Gear Tooth Rounding Machines



The Standard Machine For Gear Tooth Rounding

"Until we installed a Rochester Gear Tooth Rounding Machine we employed day and night shifts to get the work out. Now this machine turns out all the work with day shifts and is idle part of the time."

J. P. Lyon, Gear Foreman,
Putnam Machine Co., Fitchburg, Mass.



The foregoing statement is a tribute to the efficiency of the Rochester Gear Tooth Rounding Machine — the standard machine of the world for rounding gear teeth. It merits the attention of those interested in the economical, rapid and accurate rounding of gear teeth.

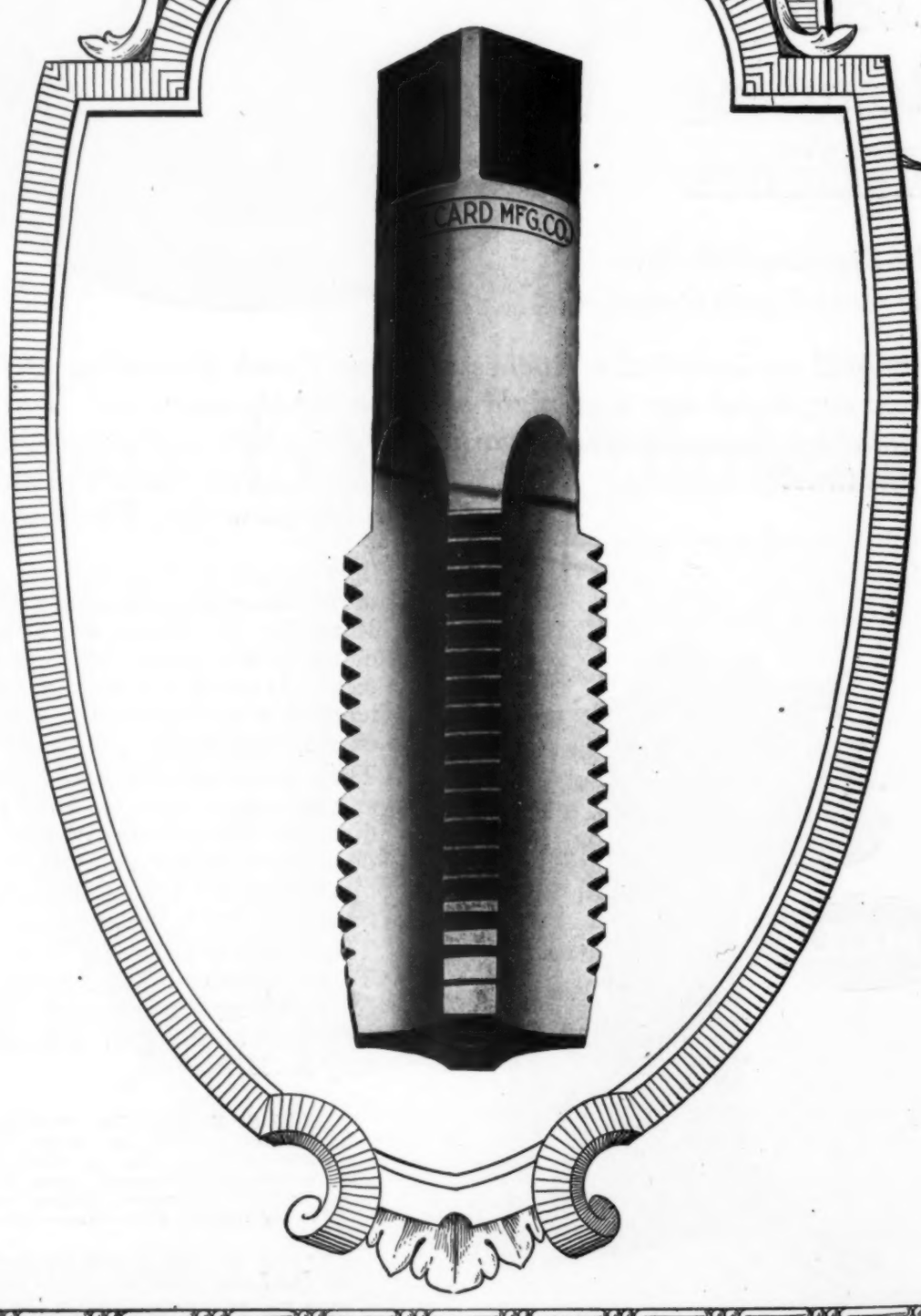
These machines will round the teeth of any type gear from 1½ inch to 30 inch diameter and practically any pitch. It does the work economically, rapidly, automatically and accurately—and does not require skilled help to operate.

The illustration shows a Rochester Gear Tooth Rounder in the Putnam Machine Co. rounding a chrome nickel, 4 pitch, 28 tooth transmission gear with a limit accuracy of .001.

With the Rochester Gear Tooth Rounding Machine you, too, can reduce your gear rounding force. Send for interesting and enlightening information about Rochester Gear Tooth Rounding Machines contained in our catalog. Don't delay—write today.

INGLE MACHINE CO.

373 St. Paul St., Rochester, N.Y.


CARD MFG.CO.

ARD

Time to turn over a new leaf—

Everybody's doing it; from war to peace—from old governments to new — from wasteful ways to saving, productive methods—

Get into line with the parade. Look into your manufacturing habits—discard the bad ones.

Especially look into your threading methods. That's where profitable reform is often possible—

And that's where we're interested. Card Taps and Dies have reformed threading in many a shop, providing a straight, fast road to better threads, better production, bigger profits.

The new Card Catalog is a good book to have. It is decidedly complete, with a new Metric Section showing sizes and lists of International and French Standard Taps and Dies, besides other valuable material.

Write for a copy.

S.W.CARD MFG.CO.

MANSFIELD, MASS., U.S.A.

EUROPEAN AGENTS—Chas. Churchill & Co., London, Birmingham, Manchester and Glasgow. Markt & Co., Ltd., Paris. V. Lowener, Stockholm, Copenhagen, Christiania. R. S. Stokvis & Zonen, Ltd., Rotterdam. Andrews & George, Yokohama, Tokyo, Osaka. J. Lambercier & Co., Geneva. C. Civita, Milano, Italy. R. D'Auglignac, Barcelona, Spain.

HAMILTON

Lathes **Planers**

EVERY Hamilton Dealer is a link in the long, strong chain of Hamilton Service. And being fully aware that "a chain is no stronger than its weakest link" we have ever been vigilant to see that every last dealer has the broad vision of SERVICE that is in keeping with Hamilton Tools.

To know machinery is not enough. Ability to close sales is of secondary importance. And even a broad knowledge of the functions of machinery and what each class of tool can accomplish is not sufficient.

The prime essential in Hamilton Dealers is **integrity** — that high conception of service which will not permit misrepre-

Dealers:

Machineshop Equipment Corp., Boston, Mass.
Machine Tool Engineering Co., New York, N. Y.
Syracuse Supply Co., Rochester, Syracuse, Buffalo, N. Y.
Sherritt & Stoer Co., Philadelphia, Pa.
Laughlin-Barney Mchy. Co., Pittsburgh, Pa.
Wolverine Mchry. & Supply Co., Detroit, Mich.
Co-operative Machinery Co., Cleveland, Ohio.
Stocker-Rumely-Wachs Co., Chicago, Ill.
Thomson Tool & Supply Co., Indianapolis, Ind.
Wm. C. Johnson & Sons Mchry. Co., St. Louis, Mo.
F. E. Satterlees Co., Minneapolis, Minn.
Hendrie & Bolthoff Mfg. & Supply Co., Denver, Colo.
Herberts Mchry. & Supply Co., Los Angeles, Cal.
General Mchry. & Supply Co., San Francisco, Cal.
M. J. Walsh Mchry. Co., Milwaukee, Wis.
Textile Mill & Supply Co., Charlotte, N. C.
Cotton States Belting & Supply Co., Atlanta, Ga.
C. H. Van Horn & Co., Inc., New Orleans, La.
H. W. Petrie, Ltd., Toronto, Ont., Canada.
Osborne & Sexton Mchy. Co., Columbus, O.

DEALERS

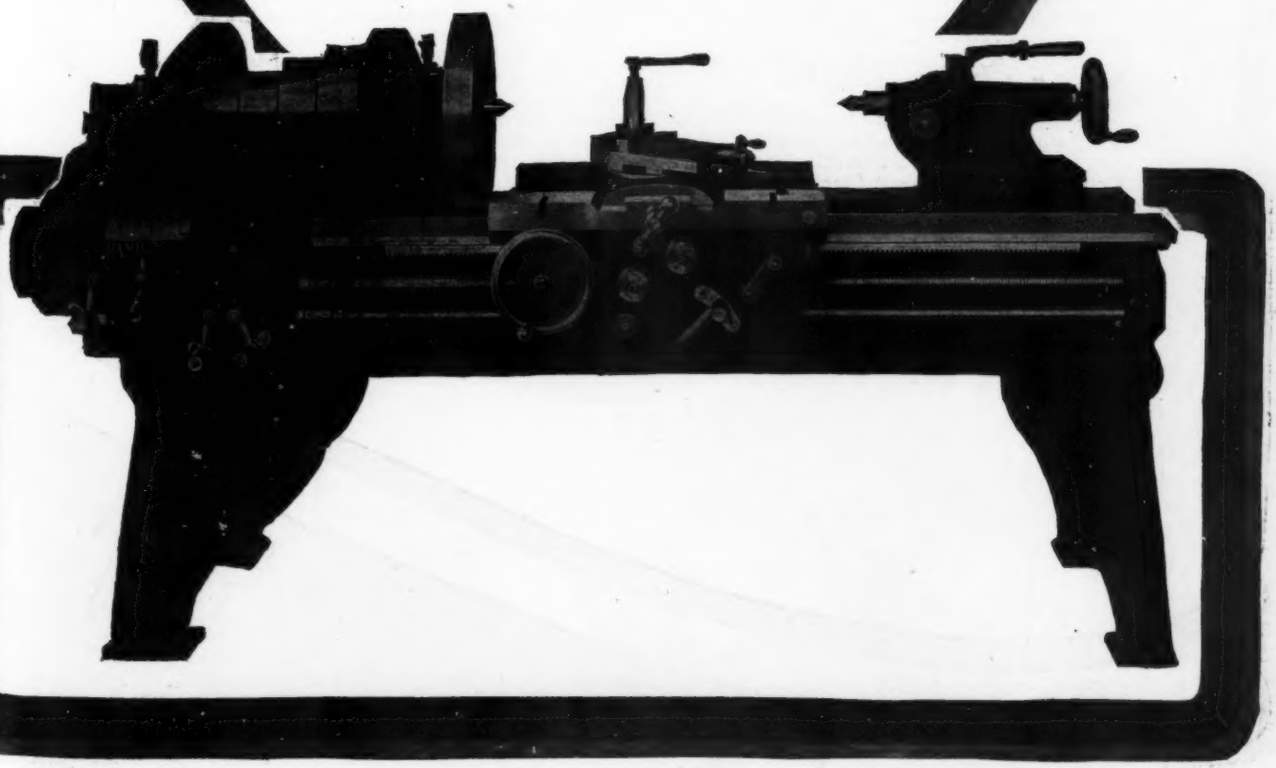
Integrity **Service**

sentation. When investigation proves the policy of a company to be that; when it is clear that its business is founded on the solid rock of service, then the company is qualified to become a Hamilton Dealer.

Hamilton Dealers will be particularly glad to tell you about the new Model Hamilton Rapid Production Lathe.

Consult the nearest Hamilton Dealer or write us direct.

Hamilton Machine Tool Co.
Hamilton, Ohio



UNION MILLING CUTTERS

Union Twist Drill Company

The Drill and Cutter Makers

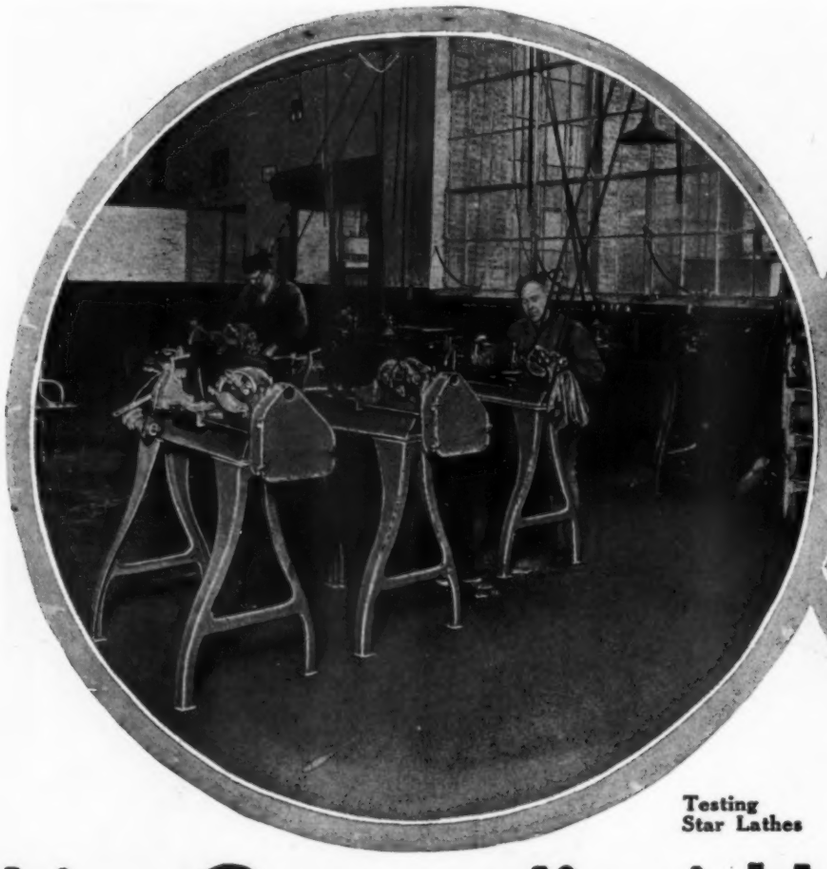
Athol, Mass.

New York Store, 62 Reade St., E. W. McKeen, Mgr. Philadelphia Store, 43 North 7th St., S. E. Weaver, Mgr. Chicago Store, 11 So. Clinton St., G. W. Lunger, Mgr. Detroit Store, 56 Cadillac Square, H. B. Kendall, Mgr

DOMESTIC AGENTS: G. R. Armstrong, Mfrs. Supplies, 252 Franklin St., Boston, Mass. W. J. Foss & Co., Springfield, Mass. Collieries Supply & Equip. Co., 14 North 5th St., Philadelphia, Pa. Syracuse Supply Co., Syracuse, N. Y. Homer Strong, 301 State St., Rochester, N. Y. Root, Neal & Co., 178-180 Main St., Buffalo, N. Y., Somers, Fitler & Todd Co., 327 Water St., Pittsburgh, Pa. White Tool & Supply Co., 1313 W. 6th St., Cleveland, Ohio. V. N. Devou Supply Co., 506 and 508 Central Ave., Cincinnati, Ohio. W. J. Baird Machinery Co., 265 Jefferson Ave., Detroit, Mich. Vonnegut Machinery Co., 43-45 S. Meridian St., Indianapolis, Ind. Badger-Packard Machinery Co., 70 W. Water St., Milwaukee, Wis. Fred Ward & Sons, 170-174 1st St., San Francisco, Calif. H. A. Harrison, 220 King St., West, Toronto, Ont.

FOREIGN AGENTS: Great Britain (Drills). Markt & Co., 98-100 Clerkenwell Rd., London. France (Drills), Markt & Co., 107 Ave. de Parmentier, Paris. Norway, Sweden and Denmark, Wilh. Sonnesson & Co., Malmo, Sweden. Australia, Bevan & Edwards, Ltd., 508 King St., Melbourne. Japan, Takata & Co., Tokyo. South America, Adolfo G. Burbanks, 843 Calle Mexico, Buenos Aires, Argentine Republic. Italy (Drills), C. Civita, Milano.

"The Tools You Buy Again"



Testing Star Lathes

No Crowding Here!

An interesting view in the Pattern Dept.

Another Secret of

STAR LATHES

Accuracy and Quality at Moderate Cost

Navigators on the Great Lakes say that danger lies not in the wind and the waves but the fact that there is not enough sea-room to manoeuvre.

We have found a similar condition true in building accuracy and quality into lathes.

We have learned that plenty of "sea-room" in the factory is a big asset.

The visitor to the Star Lathe plant might be surprised at the amount of vacant floor space.

This floor space is working for us and for the purchaser of Star Lathes just the same.

It helps us in clean, efficient work. It saves us lost motions common in crowded quarters.

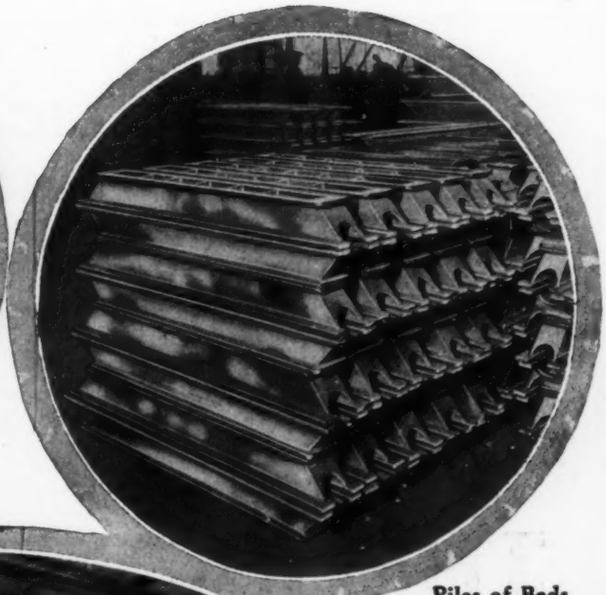
It relieves each workman of that "cramped" feeling and helps him to do his best *all the time.*

The photographs shown here give an idea of the "roomy" Star Lathe factory—where small lathes are built that are capable of replacing larger tools on light manufacturing.

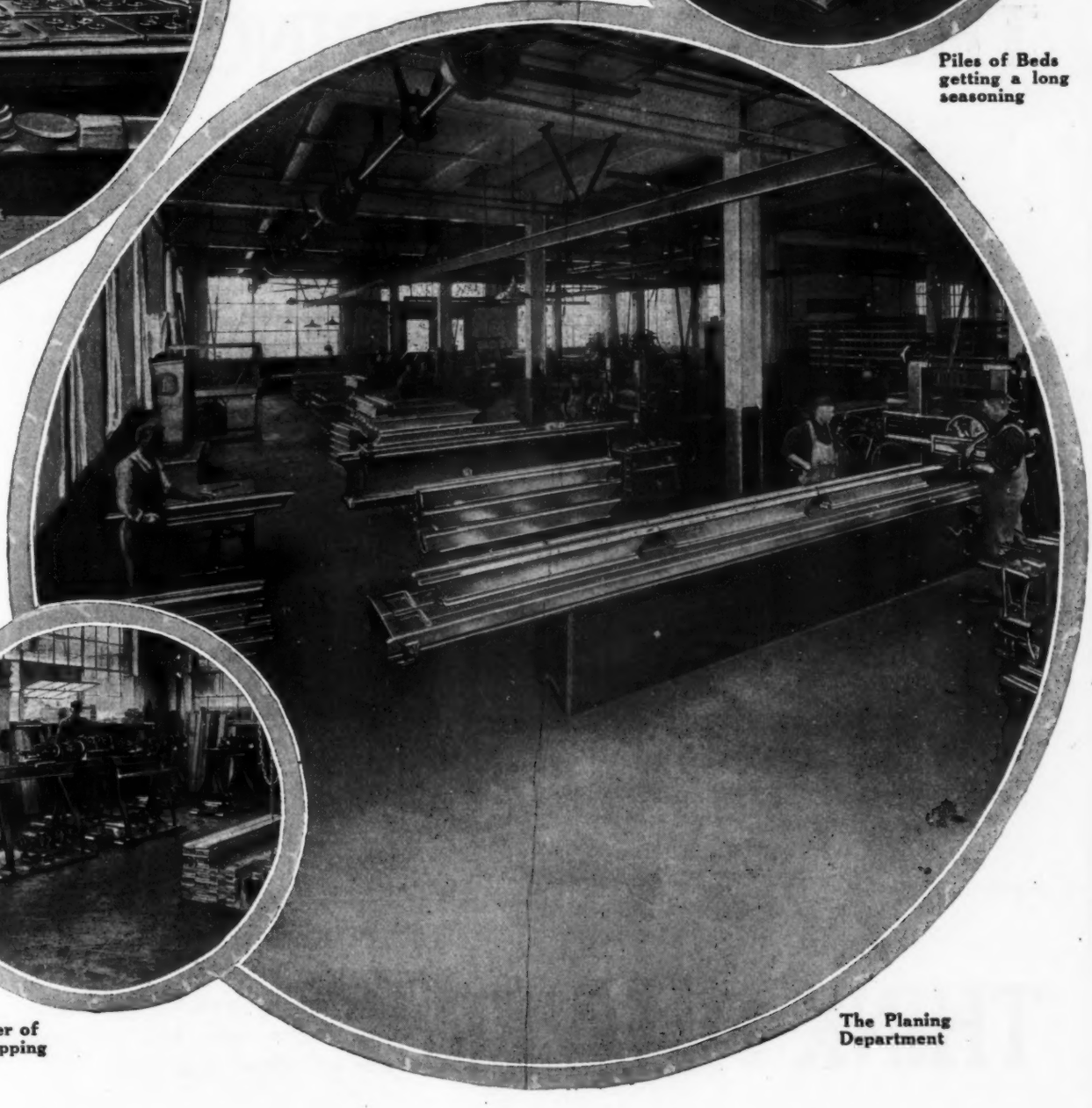
The Seneca Falls Mfg. Co., Inc.

387 Fall Street, Seneca Falls, N. Y.

Part of the Stockroom



Piles of Beds getting a long seasoning



The Planing Department

A corner of the Shipping Room

RADICAL
FITCHBURG AUTOMATIC MACHINE WORKS

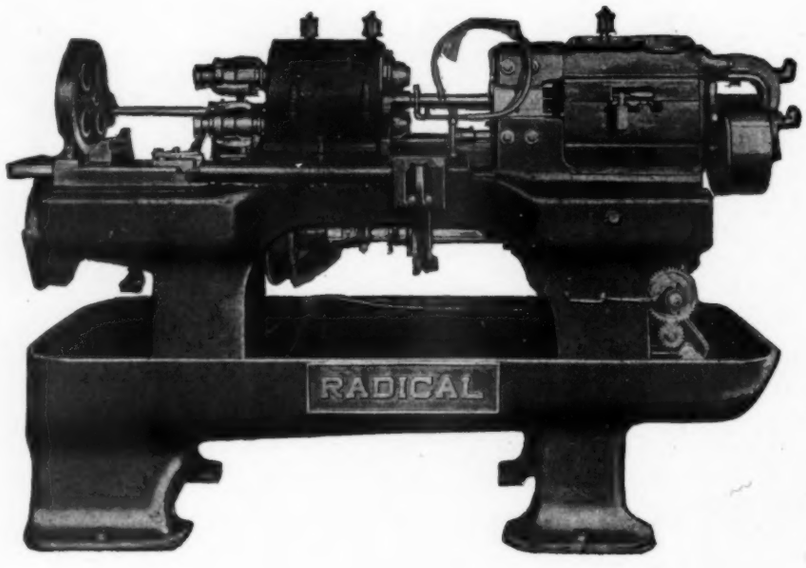
FITCHBURG, MASS.

Theory Proves and Results Establish Our Basic Claims That

THE RADICAL PRINCIPLE

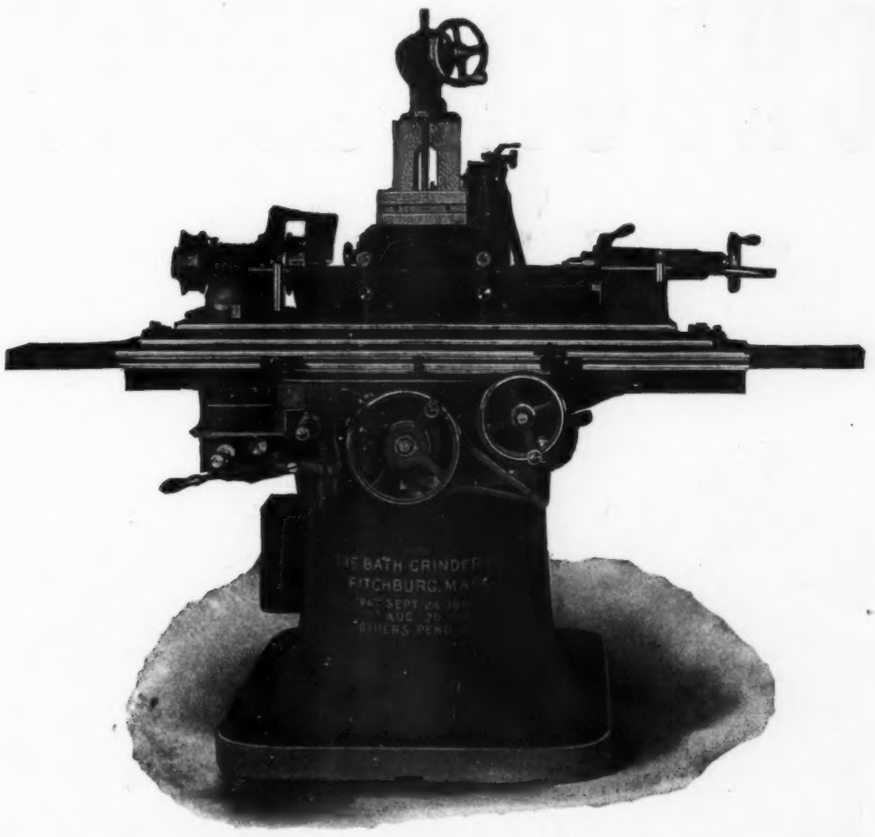
of a Solid Tool Knee and of Presenting the Work to the Tools

IS RIGHT!



THINK IT OVER

A Radical Characteristic not obtainable on any other type of screw machine



BATH UNIVERSAL GRINDING MACHINE

For Cylindrical, Surface, Internal, Tool and Cutter Grinding

Built by

Universal Grinding Machine Co.

Fitchburg, Mass., U. S. A.

AGENTS

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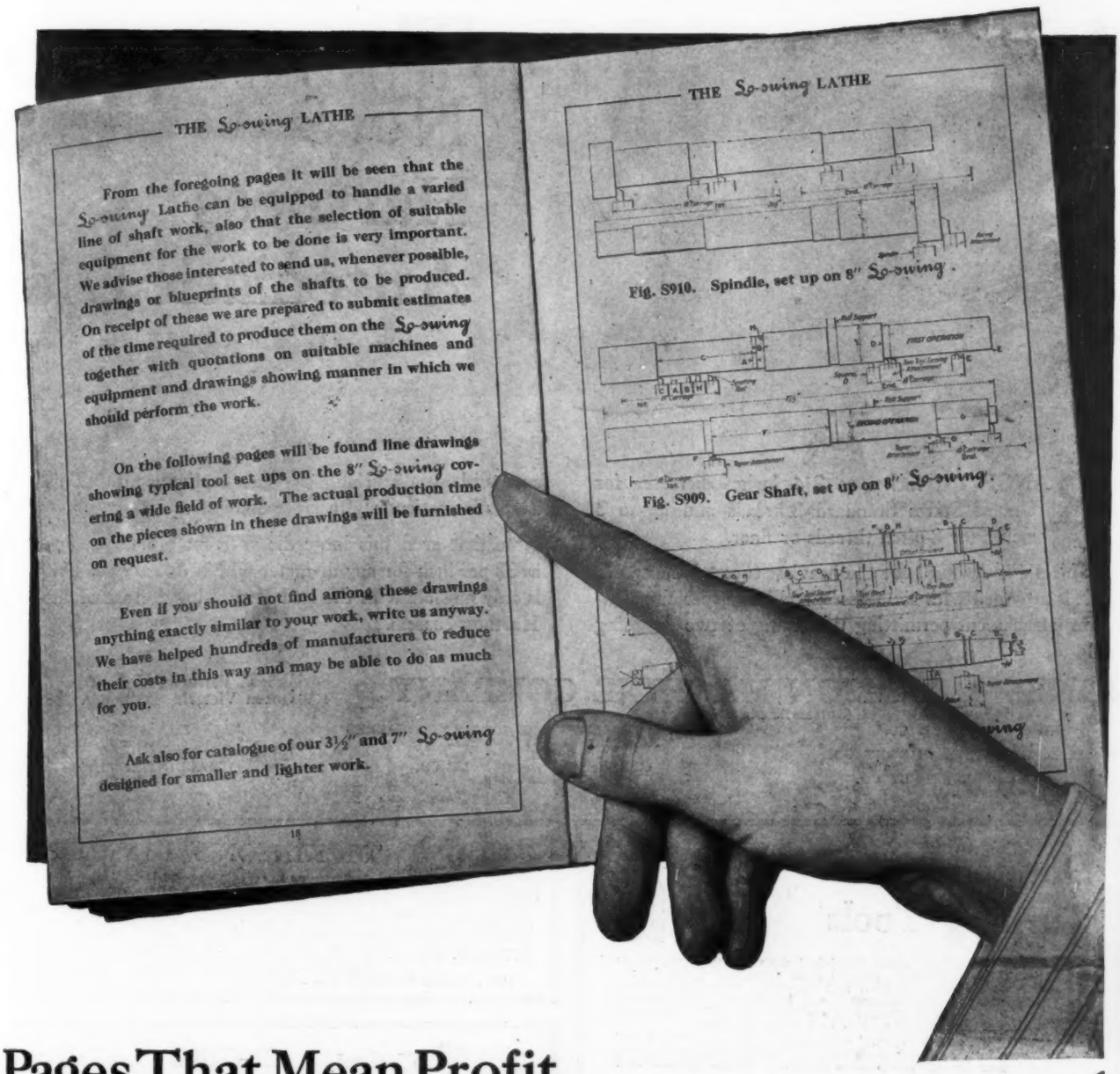
FITCHBURG

6 x 20 PLAIN CYLINDRICAL GRINDING MACHINE

MODEL B
HAND OPERATED

FITCHBURG GRINDING MACHINE CO.,
FITCHBURG, MASS., U. S. A.


THE Lo-swing LATHE
From the foregoing pages it will be seen that the Lo-swing Lathe can be equipped to handle a varied line of shaft work, also that the selection of suitable equipment for the work to be done is very important. We advise those interested to send us, whenever possible, drawings or blueprints of the shafts to be produced. On receipt of these we are prepared to submit estimates of the time required to produce them on the Lo-swing together with quotations on suitable machines and equipment and drawings showing manner in which we should perform the work.
On the following pages will be found line drawings showing typical tool set ups on the 8" Lo-swing covering a wide field of work. The actual production time on the pieces shown in these drawings will be furnished on request.
Even if you should not find among these drawings anything exactly similar to your work, write us anyway. We have helped hundreds of manufacturers to reduce their costs in this way and may be able to do as much for you.
Ask also for catalogue of our 3½" and 7" Lo-swing designed for smaller and lighter work.
18
THE Lo-swing LATHE
Fig. S910. Spindle, set up on 8" Lo-swing.
Fig. S909. Gear Shaft, set up on 8" Lo-swing.

Pages That Mean Profit

These books contain drawings and detailed information of greatest interest to those doing lathe work on a manufacturing basis.

The Lo-swing Lathe

with its multiple tools, cutting simultaneously, has cut production time tremendously on hundreds of jobs; perhaps it can do so on yours.

Use the Coupon.

Fitchburg Machine Works

Fitchburg, Mass., U. S. A.

Fitchburg Machine Works, Fitchburg, Mass.

Gentlemen: Please send me the new book on the 3½-in.—8-in. Lo-Swing Lathe (check the one desired).

Name .....

Address .....

Name of employer .....

The No. 9 Hartness Automatic Die

RANGE 1¾ inches to 2¾ inches diameter for United States Standard Threads and up to 3 inches for 8-pitch threads or finer.

This die is designed for the heaviest turret lathe work. It is provided with six chasers, and has a special roughing attachment permitting the taking of two roughing cuts without disturbing the finish adjustment. This adapts it particularly to large diameters.

Note that even this large die will cut pitches as fine as 32 per inch for any diameter within its range. This is only possible with the lead controlling feature of the Hartness chasers.

JONES & LAMSON MACHINE COMPANY, Springfield, Vermont, U. S. A.
(Automatic Die Department) 109 Queen Victoria St., London, E. C.

BOYER-CAMPBELL CO. Detroit, Mich.
The E. L. ESSLEY MACHINERY CO. Chicago, Milwaukee and Moline
W. M. PATTISON SUPPLY CO. Cleveland, O.

AMERICAN AGENTS FOR DIES AND CHASERS
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E. A. KINSEY CO. Cincinnati, O. Indianapolis, Ind.
MACHINISTS SUPPLY CO. Pittsburgh, Pa.

Diamond Turning Tools

Special Grinders furnished with either Diamond or Carbon Points. Special nibs furnished from sketch or sample. African and Brazilian Diamond Turning Tools are particularly suited for turning hard rubber, fibre, bronze, copper, aluminum or any hard gritty material, where a steel tool dulls quickly.

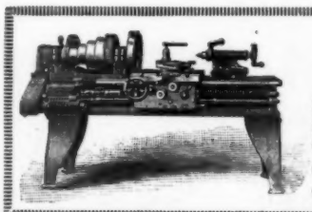
Twenty-five years' experience, expert workmen and a host of satisfied customers deserve serious consideration by my prospective patrons. **Write for Catalog!**

ARTHUR A. CRAFTS & CO.
125 Summer St., Boston, Mass.

"DICKINSON'S" DIAMOND

Tools for truing **Large, Coarse and Hard Emery, Corundum, Carborundum, Alundum, Crystolon** or other abrasive wheels will give the **greatest amount** of **service** with a **minimum** of **wear** on the **diamond.** Diamonds can be set in any style of holder desired. We've had a great many years' experience in the manufacture of Diamond tools and are thoroughly familiar with what is required of them.

THOS. L. DICKINSON, *Estab.* 1796 66 Nassau St., New York
Successor to John Dickinson.
C. W. Burton Griffiths & Co., London, Sole Agents for Great Britain.

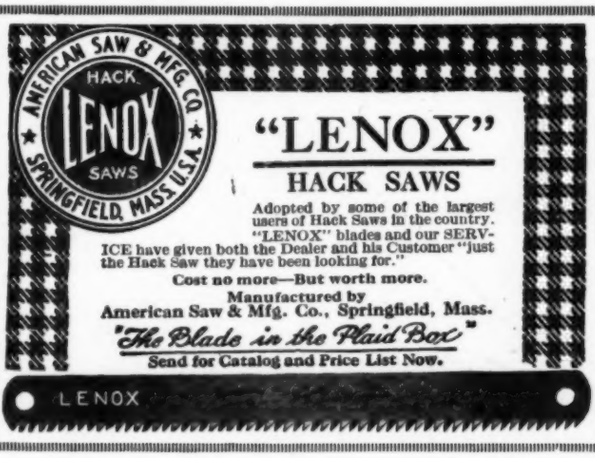


ENGINE LATHES

10-12-14-16 and 18-inch Swing

any length Beds, Quick Change or New Standard. Countershaft or Motor Drive, and with or without Taper Attachment, Draw-in Attachment. Turrets, Chucks, Tools, etc. *Send for Catalogue.*

CHAMPION TOOL WORKS CO
4947 Spring Grove Ave., Cincinnati, Ohio



"LENOX"

HACK SAWS

Adopted by some of the largest users of Hack Saws in the country. "LENOX" blades and our SERVICE have given both the Dealer and his Customer "just the Hack Saw they have been looking for."

Cost no more—But worth more.

Manufactured by
American Saw & Mfg. Co., Springfield, Mass.

"The Blade in the Plaid Box"

Send for Catalog and Price List Now.

LENOX

Black Diamond Files & Rasps

Perfect Always

Twelve Medals Awarded at International Expositions

FOR SALE EVERYWHERE
Copy of Catalog will be sent free to any interested file user on application

G. & H. BARNETT CO., PHILADELPHIA, PA.
Owned and Operated by the Nicholson File Co

SHOP MATERIALS AND SUPPLIES

ZINC SHEETS—The following prices in cents per pound prevail:
Carload lots f.o.b. mill 15.00

	In Casks		Broken Lots	
	Current	One Year Ago	Current	One Year Ago
Cleveland	18.75	21.00	18.40	21.50
New York	17.00	20.00	17.50	20.25
Chicago	22.00	21.00	21.50	21.50

ANTIMONY—Chinese and Japanese brands in cents per pound, in ton lots, for spot delivery, duty paid:

	Current	One Year Ago
New York	9.50–10.50	15.00
Chicago	10.00	17.00
Cleveland	11.62½	16.00

OLD METALS—The following are the dealers' purchasing prices in cents per pound:

	New York		Cleveland		
	Current 1918	One Year Ago	Current 1918	One Year Ago	Chicago
Copper, heavy and crucible	20.00	22.00	19.00	21.00	17.00
Copper, heavy and wire	19.00	21.00	18.00	21.00	16.50
Copper, light and bottoms	17.00	19.00	15.00	19.00	15.00
Lead, heavy	6.00	5.50	6.00	6.00	5.50
Lead, tea	4.75	4.00	4.00	5.00	5.25
Brass, heavy	11.00	14.25	14.00	14.50	16.50
Brass, light	9.00	10.50	13.00	11.50	10.00
No. 1 yellow brass turnings	11.00	14.00	10.00	13.50	10.50
Zinc	5.25	5.00	5.00	5.50	5.25

ALUMINUM—The following prices are from warehouse at places named:

	New York	Cleveland	Chicago
No. 1 aluminum, guaranteed over 99% pure, in ingots for remelting (1-15 ton lots), per lb	33.20c.	32.30c.	33½c.

This is the Government price for lots of from 1 to 14 tons.

COPPER BARS from warehouse sell as follows in cents per pound, for ton lots and over:

	Current	One Year Ago
New York	32.00	40.00
Chicago	38.00	40.00
Cleveland	36.50	33.50

BABBITT METAL—Warehouse price per pound:

	New York		Cleveland		Chicago	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Best grade	87.00	70.00	80.00	93.00	75.00	70.00
Commercial	42.00	40.00	21.50	21.50	15.00	25.00

SHOP SUPPLIES

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	New York		Cleveland		Chicago	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Hot pressed square	$0.80	1.00	$1.25	$1.40	$0.98	$1.05
Hot pressed hexagon	.80	1.00	1.05	1.20	.78	.85
Cold punched hexagon	2.50*	1.00	.75	.75	1.00	1.50
Cold punched square	2.50*	1.00	.75	.75	1.00	1.50

* List plus.

Semi-finished nuts sell at the following discounts from list price:

	Current	One Year Ago
New York	50–10%	50%
Chicago	50%	45%
Cleveland	50–10%	50%

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago
½ by 4 in. and smaller	40–10%	40–10%	37%
Larger and longer up to ½ in. by 30 in.	20–5%	20– 5%	25–5%

WASHERS—From warehouses at the places named the following amount is deducted from list price:
For wrought-iron washers:
New York..... $2.00 Cleveland..... $1.50 Chicago..... $2.50
For cast-iron washers the base price per 100 lb. is as follows:
New York..... $6.00 Cleveland..... $4.25 Chicago..... $4.50

CARRIAGE BOLTS—From warehouses at the places named the following discounts from list are in effect:

	New York	Cleveland	Chicago
½ by 4 in. and smaller	40%	45%	32½%
Larger and longer up to 1 in. by 30 in.	20–5%	20–5%	20%

COPPER RIVETS AND BURS sell at the following rate from warehouse:

	Rivets		Burs	
	Current	One Year Ago	Current	One Year Ago
Cleveland	List plus 10%	List plus 10%	List plus 10%	List price
Chicago	List price	List price	List plus 20%	List price
New York	15% from list	10% from list	List plus 5%	10-2½% from list

RIVETS—The following quotations are allowed for fair-sized orders from warehouse:

	New York	Cleveland	Chicago
Steel ½ and smaller	40%	45–5%	40%
Tinned	30%	45–5%	40%

Boiler, ½, ⅝, 1 in. diameter by 2 in. to 5 in. sell as follows per 100 lb.:
New York...$5.675 Cleveland...$5.15 Chicago...$5.67 Pittsburgh...$4.65
Structural, same sizes:
New York...$5.775 Cleveland...$5.25 Chicago...$5.77 Pittsburgh...$4.75

MISCELLANEOUS

SEAMLESS DRAWN TUBING—The base price in cents per pound from warehouse in 100-lb. lots is as follows:

	New York	Cleveland	Chicago
Copper	52.00	40.00	44.00
Brass	49.00	38.00	41.00

For immediate stock shipment 3c. is usually added. The prices of course vary with the quantity purchased. For lots of less than 100 lb., but not less than 75 lb., the advance is 2c.; for lots of less than 75 lb., but not less than 50 lb., the advance is 5c. over base (100-lb. lots); for less than 50 lb. but not less than 25 lb., 10c. should be added to the base price; and for quantities of from 10 to 25 lb. the extra is 25c.; less than 10 lb., add 35c.

Double above extras will be charged for angles, channels and sheet metal mouldings if ordered in above quantities. The above extras also apply to brass rod other than standard stock sizes—stock sizes being considered as ¼ up to 2 in. inclusive in rounds, and ¾ up to 1½ in. inclusivein square and hexagon—all varying by thirty-seconds up to 1 in. and by sixteenths over 1 in. On all shipments aggregating less than 100 lb. there is usually a boxing charge of $1.50.

TIN PLATES—Warehouse prices per box:

Coke tin plate, 14 x 20:

	Cleveland		Chicago	
	Current	One Yr. Ago	Current	One Yr. Ago
100 lb	$9.17½	$12.00	$10.60	$11.75
I. C. 107 lb	9.42½	12.17½	10.70	11.90

Terne plate, 20 x 28:

Base Weight	Net Weight	Coating				
100 lb.	200	3	18.95	18.95	19.10	17.90
I. C.	214	8	19.25	19.25	19.40	18.25
I. C.	270	8	21.75	21.75	21.40	20.35
I. C.	218	12	21.75	21.75	22.60	19.25
I. C.	221	15	22.50	22.50	22.10	19.50
I. C.	226	30	23.25	23.25	22.60	20.50
I. C.	231	25	24.50	24.50	23.10	21.30
I. C.	236	30	25.75	25.75	23.60	22.25
I. C.	241	35	26.75	26.75	25.10	23.25
I. C.	246	40	28.00	28.00	25.60	24.55

NOTE—New York prices furnished on application to dealers. Price varies according to whether the plates are wanted for work essential to the war or for nonessential work.

COTTON WASTE—The following prices are in cents per pound:

	New York			
	Current	One Year Ago	Cleveland	Chicago
White	11.00 to 13.00	13.00	16.50	12.00 to 16.50
Colored mixed	8.50 to 12.00	12.00	13.00	11.50 to 14.00

WIPING CLOTHS—Jobbers' price per 1000 is as follows:

	13½ x 13½	13½ x 20½
Cleveland	52.00	58.00
Chicago	48.00	50.00

SAL SODA sells as follows per 100 lb.:

	Current	One Month Ago	One Year Ago
New York	$1.75	$1.75	$1.75
Philadelphia	1.75	1.75	1.75
Cleveland	2.62½	2.40	2.35
Chicago	2.00	2.00	2.00

ROLL SULPHUR in 360-lb. bbl. sells as follows per 100 lb.:

	Current	One Month Ago	One Year Ago
New York	$3.65	$4.30	$4.30
Cleveland	4.25	4.60	4.50
Chicago	4.50	4.00	4.00

COKE—The following are prices per net ton at ovens, Connellsville, and cover the past four weeks:

	Dec. 19	Dec 12	Dec. 5	Nov. 28	Nov. 21
Prompt furnace	$6.00	$6.00	$6.00	$6.00	$6.00
Prompt foundry	7.00	7.00	7.00	7.00	7.00

FIRE CLAY—The following prices prevail:

		Current
Chicago	450-lb. bbl.	$2.50
Cleveland	375-lb. bag	2.50

LINSEED OIL—These prices are per gallon:

	New York		Cleveland		Chicago	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Raw in barrels	$1.59	$1.25	$1.90	$1.25	$1.77	$1.22
5-gal. cans	1.84	1.35	2.00	1.40	1.97	1.32

WHITE AND RED LEAD in 500-lb. lots sells as follows in cents per pound:

	Red				White	
	Current		1 Year Ago		Current	1 Year Ago
	Dry	In Oil	Dry	In Oil	Dry and In Oil	Dry and In Oil
100-lb. keg	14.00	14.50	12.25	12.50	14.00	12.50
25 and 50-lb. kegs	14.25	14.75	12.50	12.75	14.25	12.75
12½-lb. keg	14.50	15.00	12.75	13.00	14.50	13.00
5-lb. cans	....	....	14.25	14.00	16.00	14.50
1-lb. cans	....	....	14.25	14.50	17.00	14.50

NEW *and* ENLARGED SHOPS

Consult the Buying Section when in need of machinery or supplies

WASHINGTON, D. C.

The Navy aims to give information regarding its purchases to all manufacturers known to be in a position to supply its demand. Owing to the need of prompt action in the cases of all machine tools hereinafter listed, the Navy cannot arrange to permit a postponement of the opening of bids if the manufacturers are able to secure bidding forms and submit their bids prior to date fixed for opening.

In case time does not permit this, it will be appreciated if any manufacturer not receiving information directly regarding these purchases will notify the Purchasing Division, Bureau of Supplies & Accounts, Navy Department, Washington, D. C., in order that the firm's name may be properly listed for all future purchases.

The Bureau of Supplies and Accounts, Navy Department, will soon receive bids furnishing machines and machine tools as follows:

Schedule No. 3590—hacksaw blades, delivery various eastern and western yards.

Schedule No. 3591—hacksaw frame, delivery various eastern and western yards.

Schedule No. 7486½—bench lathes, delivery Alexandria, Va.

Schedule No. 7496½—1 bolt threading machine, delivery Charleston, S. C.

Schedule No. 7501½—1 hand planer and jointer, delivery Newport, R. I.,

Schedule No. 7502½—1 bench planer, delivery Newport, R. I.

Schedule No. 7505½—1500 drill drifts and miscellaneous drill chucks.

Schedule No. 7514½—bench lathes and equipment.

Schedule No. 7531½—slotter machine, delivery Washington, D. C.

Schedule No. 7536½—T. D. valve reseating outfits, steel sockets and tool holders.

Schedule No. 7542½—lapping machines, delivery Washington, D. C.

Schedule No. 7543½—slotting die machines, delivery Washington, D. C.

Schedule No. 7546½—engine lathe and equipment, delivery Newport, R. I.

Schedule No. 7548½—threading, cutting and pipe machines, delivery Washington, D. C.

METAL WORKING

NEW ENGLAND STATES

Conn., Hartford—H. Sodafsky, 16 Mahl Ave., has awarded the contract for a 66 x 110 ft. garage to be erected on Windsor St.

Me., Bath—Watson, Frye & Co., 19 Broad St., manufacturer of bronze castings and machinery for paper and pulp mills, plans to rebuild its plant which was destroyed by fire last spring. Loss, $75,000. Noted Apr. 25.

Mass., Boston—The Bureau of Yards and Docks, Navy Department, Washington, D. C., has had plans prepared for a galvanizing plant to be erected here. Estimated cost, $50,000.

MIDDLE ATLANTIC STATES

Md., Baltimore—The Spedden Shipbuilding Co., Boston St. and Kenwood Ave., has awarded the contract for rebuilding a portion of its shipbuilding plant which was recently destroyed by fire. Estimated cost, $55,000.

N. J., Bayonne—The Filmore Cox Corporation has acquired an 11-acre site on Newark Bay and 11th St., here, and plans to build a factory for the manufacture of a machine for bending pipe. M. Cronan, City Hall, Secy. and Treas.

N. Y., Buffalo—The German Rock Asphalt Co., 1104 Morgan Bldg., has had plans prepared for rebuilding its manufacturing plant on Kensington Ave. and New York Central Belt Line, and also building a 2-story machine shop. C. Henderson, Supt.

N. Y., Malone—The Northern Garage Corporation, 18 Broadway, Saranac Lake, has had plans prepared by G. Schrader, Arch., Main St., Saranac Lake, for a 1-story, 50 x 160-ft. garage to be erected on Elm St. here. Estimated cost, $40,000.

N. Y., New York (Borough of Brooklyn)—The Circle Garage Co., 250 Coney Island Ave., plans to build a 1-story, 50 x 200 ft. garage on Coney Island Ave. and Prospect Park West. Estimated cost, $45,000.

N. Y., New York (Borough of Brooklyn)—The Dial Manufacturing Co., 40 Lexington Ave., has awarded the contract for the erection of a 2-story addition to its factory. Estimated cost, $8000.

N. Y., New York (Borough of Brooklyn)—V. Guardino, 39 Central Ave. has had plans prepared by C. P. Cannella, Arch., 1163 Herkimer St., for a 1-story, 25 x 100-ft. addition to his garage at 1925 Central Ave. Estimated cost, $15,000.

N. Y., New York (Borough of Brooklyn)—The Ideal Construction Co., 292 Rogers Ave., will build a 1-story, 100 x 100 ft. garage at 200-206 Emerson Pl. Estimated cost, $25,000.

N. Y., New York (Borough of Brooklyn)—The Pohl-Abbott Construction Co., 200 Montague St., will build a 1-story, 100 x 131 ft. garage on Ocean Ave. and Ave. N. Estimated cost, $35,000.

Penn., Erie—The Erie Crucible Steel Co. has awarded the contract for the erection of a 60 x 60 ft. and 76 x 100 ft. addition to its plant.

Penn., Forty Fort (Kingston, P. O.)—The International Fabricating Corporation, Wilkes-Barre, has had plans prepared for the erection of a 2-story, 50 x 160-ft. addition to its plant here. Estimated cost, $60,000.

Penn., Petroleum Center—The Pennsylvania Tank Car Co. plans to rebuild its plant which was recently destroyed by fire and will install modern machinery.

Penn., Pittsburgh—The Carbon Steel Co. 32nd St. and Allegheny Rd., has awarded the contract for the erection of three 1-story, 40 x 40 ft., 60 x 60 ft. and 80 x 80 ft. machine shops.

Penn., Rutherford—The Philadelphia & Reading R.R., Reading Terminal, Philadelphia, plans to build a machine shop and a boiler house, here. Estimated cost, $45,000. S. T. Wagner, Philadelphia, Ch. Engr.

Penn., Sharpsville—The Sharpsville Boiler Works, 6th St., recently increased its capital stock from $50,000 to $100,000 and is building 30 x 75 ft. and 50 x 75 ft. additions to its plant.

SOUTHERN STATES

Ky., Louisville—The H. Vogt Machine Co., 10th and Ormsby St., plans to install 2 or 3 traveling cranes in its shops.

Tenn., Chattanooga—The Casey-Hedges Boiler Co. plans to build an addition to its plant. Estimated cost, $20,000.

MIDDLE WEST

Ill., Chicago—The Acme Boiler & Tank Co., 1017 West 48th St., plans to build a 1-story, 52 x 85 ft. factory and machine shop. Estimated cost, $15,000. Westcott Engineering Co., 111 West Washington St., Consult. Engr.

Ill., Chicago—The Booth Fisheries Co., 22 West Monroe St., is in the market for a power belt-driven drill press, capacity 1½ in. through 2-in. steel.

Ill, Chicago—The Interstate Iron and Steel Co., 101 South Michigan Ave., is in the market for a continuous cutting or gap shear, for 16 ga. and lighter iron, foot power.

Ill., Chicago—The Victor Manufacturing & Gasket Co., 1956 South Troy St., plans to build a group of 1- and 2-story buildings on 12th St. and 58th Ave., for the manufacture of gas engine gaskets. Estimated cost, $250,000. A. S. Alschuler, 28 East Jackson St., Arch.

Mich., Detroit—The Board of Education, 50 Broadway, is in the market for the following machine tools with which to equip its machine shop and foundry in Cass Technical High School: 40 lathes, 3 shapers, 2 milling machines, 4 drill presses, 6 emery stands, 2 high-speed metal saws, 2 gas furnaces, 3 arbor presses, 2 tool post center grinders, 60 drills, milling cutters and complete equipment of machine tools, 1 to 8-in. belt lacing machine, cupola with blower, tumbling mill, pneumatic sand sifter, brass melting furnace with blower, 5 graphite crucibles and portable core oven.

Mich., Detroit—The Flower Stephens Manufacturing Co., Clayton and Parkinson St., has awarded the contract for the erection of a 1-story, 135 x 225 ft. foundry. Noted Dec. 12.

Mich., Detroit—The Michigan Smelting and Refining Co., 1685 Joseph Campau Ave., has had plans prepared by A. Kahn, Arch., Marquette Bldg., for a 2-story, 50 x 63 ft. cupola house, to be erected on Clay and Joseph Campau Ave. An ore hoist and tipple will be installed. Noted Dec. 5.

Ohio, Cleveland—The Dust Recovering and Conveying Co., 945 Engineers Bldg., has acquired the building at 1710-14 Woodland Ave., and plans to equip same for its own use.

Ohio, Dayton—The Burnett-Larsh Co., 127 East 3rd St., manufacturer of electric pumps and water systems, has acquired the 4-story factory of the Burkhardt Furniture Co., on Monument Ave. and Webster St., and will equip same for its own use.

Ohio, Warren—The Heltzel Steel Form and Iron Co. is in the market for a punch press with punching slot ⅝ x 18 in. for ½-in. soft steel.

Wis., Hartford—The International Steel Products Co., 1053 3rd St., Milwaukee, plans to build a 2-story, 66 x 116-ft. plant here. Estimated cost, $30,000.

Wis., Kaukauna—The Thilmany Pulp and Paper Co. plans to build a 2-story, 70 x 70 ft. addition to its machine, blacksmith and carpenter shop. Estimated cost, $50,000.

Wis., Milwaukee—The City Water Department plans to build a 1-story, 100 x 120 ft. meter repair shop on 3rd and Clinton St. Estimated cost, $60,000.

Wis., Milwaukee—The M. J. Walsh Machinery Co., 141 Syracuse St., is in the market for a number of lathes ranging in swing from 22-48, with 30 ft. bed or longer; 28 x 60 x 60 ft. planer with 2 or more heads; 5 ft. universal radial drill; slotter, 18-in. stroke, double head; 1¼ in. Landis bolt cutter and a 6 ft. boring mill.

Wis., Racine—The Perfex Radiators Co., 18th and Flett Ave., manufacturer of automobile radiators, has had plans prepared for the erection of a 2-story addition to its factory. Estimated cost, $100,000.

Wis., Racine—The E. C. Tecktonius Manufacturing Co., 1224 13th St., manufacturer of hardware specialties, plans to build a 2-story, 100 x 160 ft. addition to its plant with two 50 x 80 ft. wings. D. R. Davis, 526 Wisconsin St., Arch.

Wis., Watertown—O. Biefeld Co., 202 North Water St., will build a 66 x 124-ft. foundry next spring. Estimated cost, $75,000.

Wis., West Allis—F. M. Davis, 350 24th Ave. and J. T. Thompson, 1580 Stowell Pl., both of Milwaukee, plan to build a 1-story, 100 x 200 ft. factory here for the manufacture of milling and special machinery. Noted Sept. 26.

WEST OF THE MISSISSIPPI

Iowa, Cedar Falls—The Wagner Manufacturing Co. is in the market for a press similar to a Bliss No. 39, either with or without adjustable table.

Iowa, Gutenberg—The Farm Traction Works has awarded the contract for the erection of a factory. Estimated cost $15,000.

CONTRACT WORK

WANTED AND TO LET

Does the heading attract your attention? If so, you are undoubtedly interested—one way or the other; so are other readers of the American Machinist—many thousands of them.

The 24,000 copies of this issue go into an endless variety of manufacturing establishments placing orders for castings, stampings, screw machine products, special machinery, and all the other mass of contract work specialties.

To shops soliciting this work and to manufacturers placing it (with occasional capacity to take on work themselves) the

CONTRACT WORK

section—represents an ideal means of soliciting and placing orders.

Are You Interested?

Iowa, Iowa City—The O'Leary Auto Co., c/o J. O'Leary, is having plans prepared for the erection of a 1-story, 80 x 112-ft. garage.

Kan., Armourdale (Kansas City P. O.)—Wilson & Co., Osage and Adams St., Kansas City, Mo., has awarded the contract for the erection of a 3-story, 50 x 60 ft. machine shop.

Minn., Minneapolis—The Emerson Brantingham Co., South Independence Ave., Rockford, Ill., manufacturer of agricultural machinery, is building a 2-story, 60 x 100 ft. plant on University Ave., here. Noted Dec. 12.

Mo., St. Louis—The City and Chamber of Commerce plan to build hangars and machine shops for aerial mail service. P. Bunn, Secy., Chamber of Commerce.

Mo., St. Louis—D. O'Neil, 6481 Ellenwood Ave., has awarded the contract for a 1-story, 150 x 150 ft. motor service station to be erected at 203-7 South 14th St. Estimated cost, $50,000.

Mo., St. Louis—The Scullin Steel Co., 6700 Manchester Ave., plans to build a 1-story addition to its machine shop. Estimated cost, $12,000.

Tex., Fort Worth—The Gulf Well Machinery and Manufacturing Co., Dan Waggoner Bldg., plans to build a plant for the manufacture of oil well machinery. Plans include an 85 x 250-ft. machine shop, 80 x 160-ft. foundry, forge shop, power house, garages, etc. Estimated cost, $225,000.

Tex., Fort Worth—The Peden Iron and Steel Co. has had plans prepared for the erection of a plant on South Main St.

Tex., San Juan—F. E. Powell has awarded the contract for the erection of a 50 x 120 ft. garage. Estimated cost, $15,000. Noted July 11.

WESTERN STATES

Calif., Los Angeles—W. H. Jahns, 912 West Pico St., will build a 1-story, 80 x 100 ft. machine shop addition. Noted Dec. 12.

Calif., San Francisco—The American Express Co. has awarded the contract for a blacksmith shop to be erected on Hawthorne St. near Folsom St Estimated cost, $10,000.

Wash., Puget Sound—The Bureau of Yards and Docks, Navy Department, Washington, D. C., plans to build a locomotive house and garage here. Estimated cost, $25,000.

CANADA

B. C., Vancouver—Fire recently destroyed the plant of the Morrison Steel and Wire Co., 831 Powell St. Loss, $150,000. F. W. Wilkinson is interested.

B. C., Victoria—The Victoria Machinery Depot, 343 Bay St., will build shipyards and machine shop. Estimated cost, $350,000.

N. B., St. John—The Canadian Avero Co. plans to build a factory next spring for the manufacture of aeroplanes, etc.

N. S., Halifax—The Canada Metal Co., 37 Fraser Ave., Toronto, Ont., plans to build a manufacturing plant here. Estimated cost, $50,000. W. G. Harris, Toronto, Ont., Pres.

Ont., Hamilton—The Talman Brass and Metal Co., Sanford Ave., has awarded the contract for the erection of a 1-story addition to its plant. Estimated cost, $5000.

Ont., Tilbury—O. J. Cavanaugh plans to build a foundry. Estimated cost, $10,000.

Ont., Toronto—J. M. Armstrong, 110 Mail Bldg., is in the market for the contents of a small machine shop or tool room.

Ont., Toronto—J. T. Hepburn Co., 12 Van Horn St., iron founders, plans to build an addition to its plant. Estimated cost, $12,000.

Que., Montreal—The Stinson-Reeb Builders' Supply Co., 45 St. Alexander St., is in the market for a jam crusher, capacity, 200 tons or more per 10 hours.

Que., Three Rivers—The Three Rivers Steel Foundry Co., Ltd., plans to build an addition to its plant and install additional machinery. Estimated cost, $40,000. A. B. Charlton, Mgr. and Engr.

GENERAL MANUFACTURING

NEW ENGLAND STATES

R. I., Providence—The Bourn Rubber Co., Warren St., has awarded the contract for a 20 x 60 x 90-ft. addition to its factory. Estimated cost, $20,000.

MIDDLE ATLANTIC STATES

Del., Wilmington—The Diamond Ice and Coal Co., 911 Market St., will build a 1-story, 100 x 150 ft. ice manufacturing plant on Pennsylvania and Grant Ave. Estimated cost, $30,000. Noted Dec. 5.

Md., Elkton—The Scott Fertilizer Co. plans to rebuild its plant which was recently destroyed by fire. Estimated cost, $250,000.

N. J., Newark—The Edison Lamp Works of the General Electric Co., Sussex St., Harrison, has acquired property on Frelinghuysen and Evergreen Ave. here and plans to build a plant.

N. J., Westfield—The Kling Furniture Co., Mayville, has had plans prepared for the erection of a 1-story, 64 x 500-ft. factory here. Estimated cost, $30,000. J. A. Kling, Pres.

N. Y., Buffalo—The Acheson Graphite Co. has awarded the contract for the erection of a 1-story, 40 x 40-ft. addition to its plant. Estimated cost, $15,000.

N. Y., Buffalo—The Prest-O-Lite Co., 720 Main St., has awarded the contract for a charging plant to consist of 4 buildings to be erected on Colgate Ave., Hopkins and Tifft St. Estimated cost, $75,000.

N. Y., New York (Borough of Brooklyn)—J. Bone & Sons, 614 Dean St., manufacturer of chemicals, is having plans prepared by W. H. Gompert, Arch., 171 Madison Ave., New York City, for a 3-story, 100 x 100 ft. factory to be erected on Carlton Ave. near Fulton St.

N. Y., New York (Borough of Richmond)—The Downey Shipbuilding Corporation, Richmond Terrace, will build a shipyard. Estimated cost, $1,000,000.

N. Y., Tarrytown—The Hudson Shipbuilding Corporation is building a new 1-story addition to its plant. Estimated cost, $20,000.

Penn., Bellefonte—Fire recently destroyed the plant of the American Lime and Stone Co. at Frankstown. Loss, $25,000. The company plans to build a new plant here.

Penn., Bridgeport—The Diamond State Fibre Co. is building a 1-story, 52 x 68 ft. and 20 x 75 ft. plant on Front St. Estimated cost, $25,000.

Penn., Mt. Holly Springs—The Mt. Holly Paper Co., c/o H. Maynard, Boston, Mass., has awarded the contract for the erection of a 1-story, 22 x 25-ft. addition to its factory here. Estimated cost, $5000.

Penn., Neville Island (McKees Rocks, P. O.)—The Rockgas Products Co., 345 4th Ave., Pittsburgh, has had plans prepared for a 1-story, 10 x 40 ft. refinery to be erected here. Estimated cost, $15,000. C. L. Kerr, Pres.

Penn., Philadelphia—J. and J. Dobson, 809 Chestnut St., manufacturer of carpets, blankets, yarn, etc., is building a 2-story factory. Estimated cost, $20,000.

Penn., Philadelphia—The Imperial Woolen Co., Main and Rector St., is improving and building an addition to its factory. Estimated cost, $35,000. Noted Dec. 12.

Penn., Pittsburgh—Armour & Co., 310 Anderson St., has had plans prepared for a 5-story packing plant and storage warehouse to be erected on Anderson and Lacock St.

SOUTHERN STATES

Fla., Okeelanta—The Okeelanta Stock Farms, Packing & Canning Co., 212 New Tatum Bldg., Miami, plans to build canning and dehydrating plants, near here. B. G. Cheek, Pres. and Gen. Mgr.

Ga., Americus—The Atlas Underwear Co., Piqua, Ohio, plans to build a yarn-spinning mill here.

Ky., Pineville—The Asher Stave and Lumber Co. plans to install machinery and equipment for cutting lumber and staves.

Ky., Torrent—The McCombs Oil Co., Inter Southern Bldg., Louisville, plans to establish a plant here, and will require coils, condensors, agitators, stills and general refining equipment. A. Renick, Pres.

Miss., Lyman—The Ingram-Day Lumber Co. plans to rebuild its sawmill and machine shops which were recently destroyed by fire. The company will install band, circular and gang saws, to have a daily capacity of 125,000 ft. Loss, $150,000. Noted Nov. 28.

Va., Broadway—The Mutual Cold-Storage Co. plans to repair its 70 x 70-ft. plant recently damaged by fire and build a 30 x 40-ft. mill and ice plant.

W. Va., Bluefield—The Bluefield Candy Co. has leased a building here and plans to equip same for its own use.

MIDDLE WEST

Ill., Chicago—L. F. Nonnast & Son, c/o Hart & Whetson, 5 North La Salle St., manufacturer of tables, will build a 1 and 3-story plant. Estimated cost, $7000. Mundie & Jensen, 39 South La Salle St., Arch.

Ill., Chicago—Wilson & Co., Union Stock Yards, plans to build a 2-story, 66 x 100-ft. addition to its canning factory on 44th St. and Southwest Blvd. Estimated cost, $60,000.

Ind., Evansville—The Evansville Packing Co., Morgan Ave., has awarded the contract for the erection of a 1-story, 35 x 53-ft. addition to its packing plant. Estimated cost, $10,000. Noted Dec. 12.

Ind., Hartford City—The Ft. Wayne Corrugated Paper Co., Murray and Barr St., Ft. Wayne, plans to build a 2-story addition to its factory here. Estimated cost, $75,000.

Ohio, Cleveland—The Ohio Bronze Powder Co., 1120 East 152d St., has awarded the contract for the erection of a 2-story, 56 x 70-ft. factory. Estimated cost, $18,000.

Ohio, Columbus—The Federal Glass Co., Innis Ave., is building a 3-story, 122 x 257 ft. factory for the manufacturing of paper boxes. Estimated cost, including equipment, $300,000.

Ohio, Youngstown—The Industrial Gas and Chemical Co., recently incorporated with $250,000 capital stock, plans to build a plant for the manufacture of welding gases, chemicals and dyestuffs.

Wis., Belleville—The Helvetia Condensed Milk Co. is building a 1-story, 115 x 165-ft. condensory. Estimated cost, $50,000. C. D. Baker, Mgr.

Wis., Milwaukee—The Milwaukee Paper Box Co., 400 Florida St., has had plans prepared for a 5-story, 120 x 144 ft. plant to be erected on Muskegon Ave. and South Pierce St. Estimated cost, $225,000.

Wis., Milwaukee—The Sterling Wheelbarrow Co., 64th and Pullen Ave., plans to build a 1- and 2-story, 125 x 300-ft. addition to its factory. Estimated cost, $60,000. Klug & Smith, Mack Blk., Engr.

WEST OF THE MISSISSIPPI

Iowa, Keokuk—The Gas Tank Recharging Co., 752 Pierce St., Milwaukee, Wis., is building a plant here for the manufacture of calcium carbide. Estimated cost, $500,000. Noted Oct. 24.

Mo., St. Louis—The Connelly Manufacturing Co., 210 North 7th St., manufacturer of stationery tags, jewelry boxes, etc., leased a building covering 10,000 sq.ft. floor space at 701 Lucas Ave. and will equip same for its own use.

Mo., St. Louis—The Stifels Union Brewing Co., Gravois and Michigan St., has awarded the contract remodeling a brewery into an oleomargarine factory. Estimated cost, $70,000. O. F. Stifel, Pres.

Okla., Tulsa—The Daniel Shoe Co., 417 South St. Francis Ave., Wichita, Kan., plans to build a new plant here.

Okla., Tulsa—The U. S. Compression Inner Tube Co., recently organized, plans to build a 50 x 300-ft. plant and install rubber machinery. M. C. Hale, Pres.

Tex., Fort Worth—The El Dorado Refining Co. plans to build an oil refinery, capacity 5000 barrels. Estimated cost, $1,000,000.

Tex., Fort Worth—The Evans Thwing Co. plans to build a refinery to have a capacity of 3500 bbls. Estimated cost, $600,000.

WESTERN STATES

Calif., Laverne (Mill Valley P. O.)—The Laverne Lemon and Orange Growers' Association has awarded the contract for the erection of a 1-story, 68 x 113 ft. packing house and a 1-story office. Estimated cost, $20,000.

Calif., San Diego—Musher & Co., 140 Liberty St., New York City, has authorised J. G. Buerkle, San Diego, to begin negotiations for the erection of a fish cannery and olive oil packing plant here. Estimated cost, $100,000.

CANADA

B. C., Point Grey—A. MacLeod, represented by J. F. Noble, 510 Hastings St., W., plans to build a sawmill. Estimated cost, $60,000.

Ont., Bridgeburg—The Canadian-Chicago Bridge and Iron Co. is negotiating for a 600 ft. waterfront site on the Niagara River, on which it plans to erect a shipbuilding plant and a dock.

Que., Clarke City—The Gulf Pulp and Paper Co. plans to build a paper mill. Estimated cost, $10,000. T. Clarke, Supt.

Que., Three Rivers—The Wabasso Cotton Co., St. Maurice St., plans to build an addition to its cotton mills. Estimated cost, $300,000. C. R. Whitehead, Mgr.

A Message for YOU

may be included in the Searchlight advertisements of this issue. They catalog the current needs and special opportunities of the machinery field.

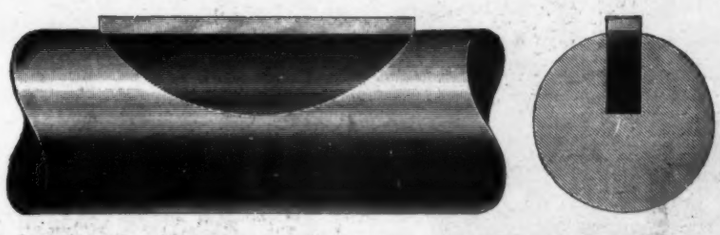
Note the steel stock and small tools offered by a private owner; the opportunities for buying established shops; to acquire a Canadian factory. Note the opening for a Superintendent; the high-grade Works Manager looking for a new connection. The big variety of equipment wanted and for sale.

You may be passing up a real opportunity if you do not look over the Searchlight pages each week. Better start the habit NOW.

See pages 268 to 297

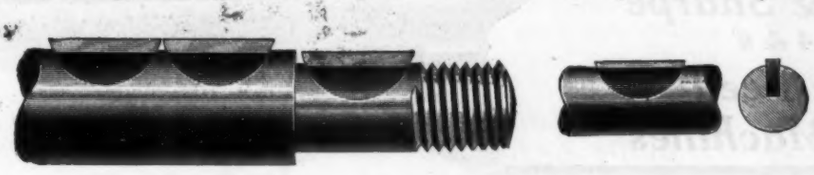
"WHITNEY" MACHINE KEYS

For the Woodruff System

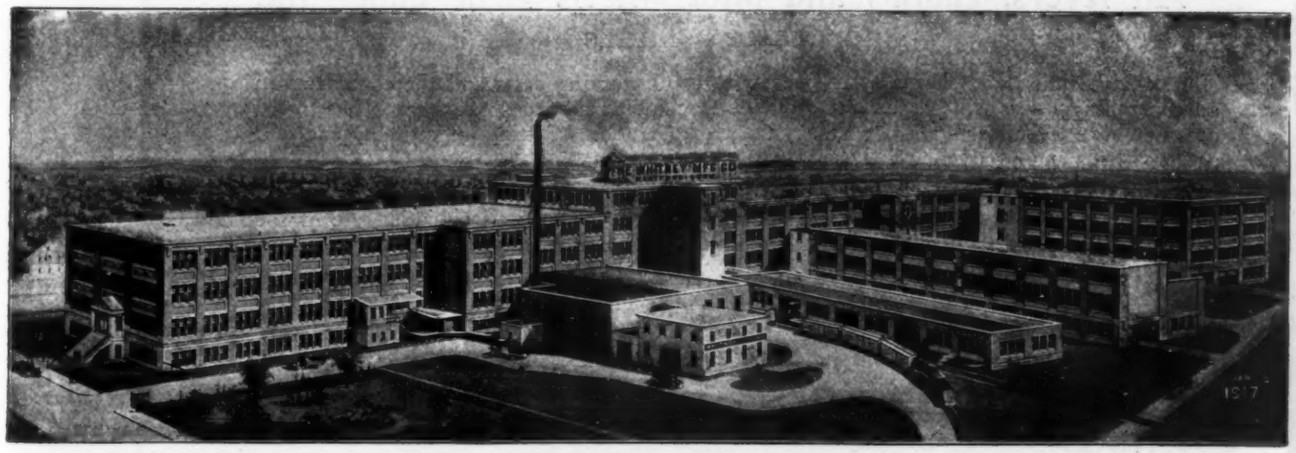


NO FITTING REQUIRED

If you are not already using this modern method of key-seating, don't delay longer but adopt it at once. Every day that you put off changing is costing you time and money. It is saving money constantly for others. Why not for you?



Our customers state that sometimes it saves as much as 75% over the old method.



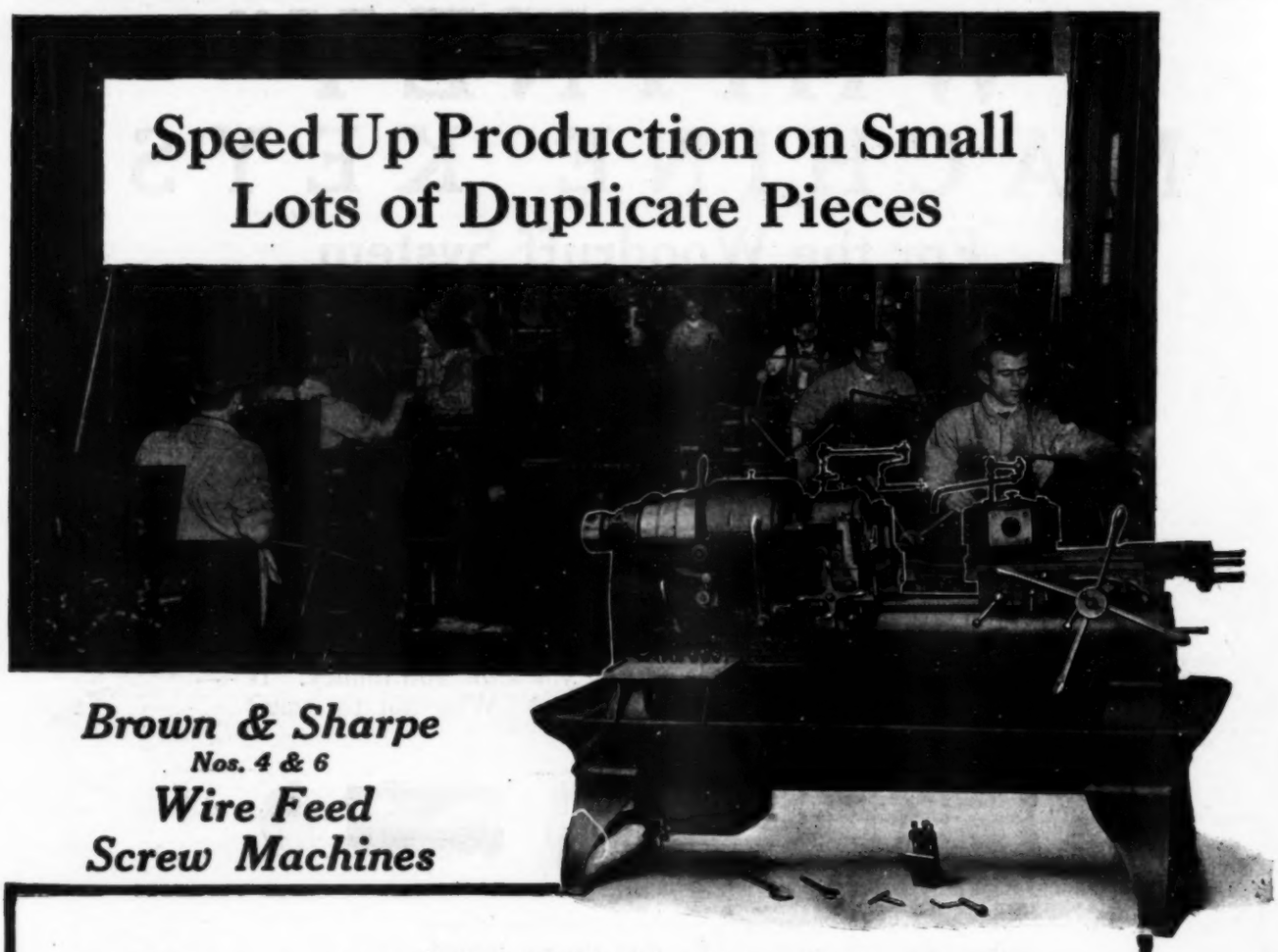
The Home of the "Whitney" Products

All of our factory buildings are fire-proof. When you place your order with us you run no risk of having your production held up by a fire in our plant.

THE WHITNEY MFG. CO., Hartford, Conn.

CHAINS **KEYS AND CUTTERS** **HAND MILLING MACHINES**

Speed Up Production on Small Lots of Duplicate Pieces



Brown & Sharpe
Nos. 4 & 6
Wire Feed
Screw Machines

All levers, clamps and pilot wheels right under the operator's hands

The positive action and simplicity of operation of all working parts and the concentration of all controlling levers, wheels, etc., at front of machine minimize lost time. The operator does not have to shift his position at any stage of operation. Setting up is simply and quickly accomplished, and production is rapid.

Automatic feed advances stock through spindle, where it is positively gripped in chuck. This chuck handles all sizes of bar stock within capacity of machine, thus obviating use of special collets—a great time-saving feature. Round, square or hexagonal stock can be handled without changing parts of chuck.

On small lots and hurry jobs

these machines maintain a rate of production that will satisfy the most exacting production men.

Send for Catalog TODAY

Let us tell you about our entire line of screw machines in detail. Send for Catalog 21-G.

BROWN & SHARPE MFG. CO.

Providence, R. I., U. S. A.

OFFICES

Chicago, Ill., 626-630 Washington Blvd. Philadelphia, Pa., 1103-1105 Liberty Bldg. Pittsburgh, Pa., 2538 Henry W. Oliver Bldg.

BROWN & SHARPE OF NEW YORK, INC.

New York, N. Y., 20 Vesey St. Rochester, N. Y. 415 Chamber of Commerce Bldg. Syracuse, N. Y., 419 University Block.

REPRESENTATIVES IN OTHER LEADING CITIES

CELFOR

Boiler Drilling is a Tough Test

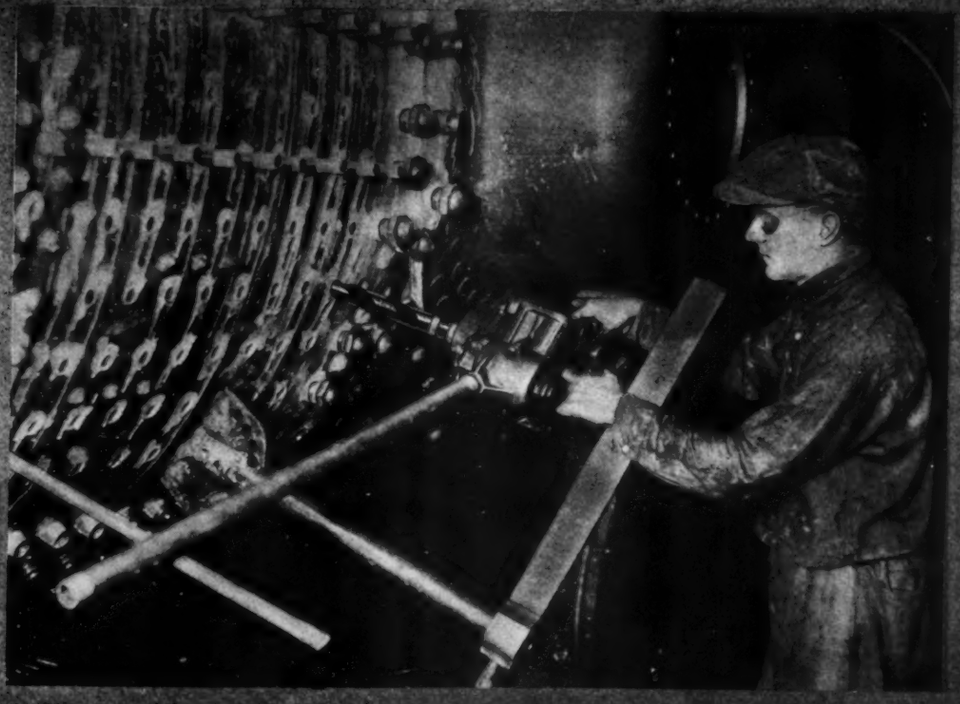
But it is the trying conditions that tell the most emphatic story of Celfor stamina. The Ingersoll-Rand Co. is *glad* to have the Celfor High Speed Twisted Drill shown in connection with their Little David Portable Drill. You can easily guess the reason.

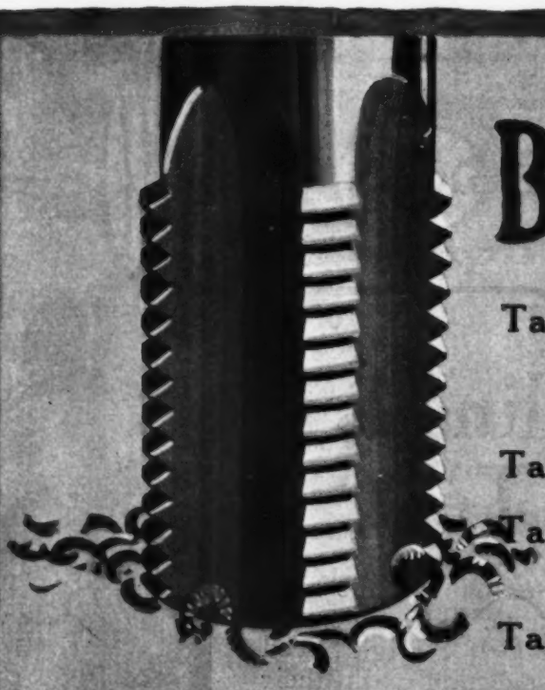
But you cannot very well guess the extent of Celfor efficiency in portable drilling, or as cutting tools for heavy duty drilling machines, until you have tried the Celfor on your most difficult work.

Clark Equipment Company

***Main Office and Works:* BUCHANAN, MICH.**

Canada—Rudel-Belnap Machinery Co., Montreal and Toronto. Great Britain—The Coats Machine Tool Co., Thanet House, London. Japan—Andrews & George, Tokyo.





BUTTERFIELD

Taps that add a finished, clean-cut appearance to the work of your best mechanics.

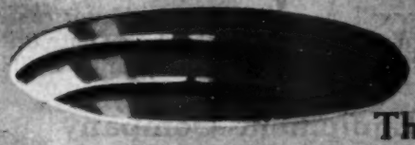
Taps that cut fast and cut true.

Taps that last—long after others have gone into the scrap heap.

Taps that reduce the charges you've had to make against breakage.

Those are the taps your storeroom should be stocked with completely.

They're Butterfields.



A judicious purchaser keeps our catalog No. 17 close at hand.

We'll mail you a copy too if you'll write us.

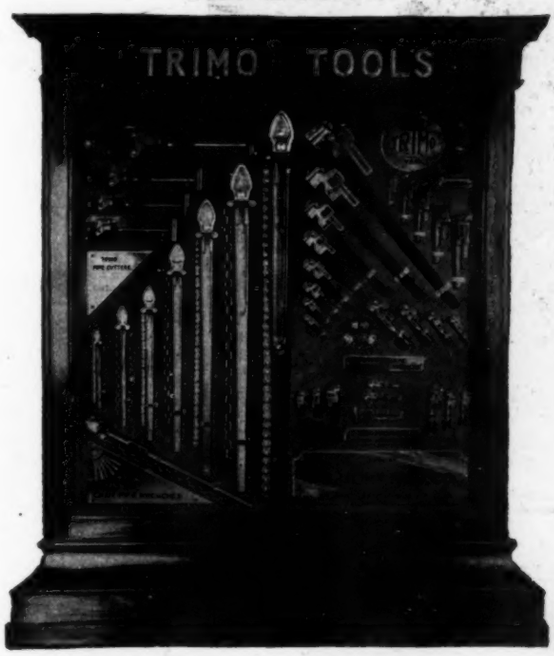
Butterfield and Company

Derby Line, Vermont, U. S. A.

New York Store—62 Reade Street. Canada—Rock Island, Quebec. Metal and Hardware Products, Ltd., 104 High Holborn, London, W. C., England; Fenwick, Freres & Co., 8 Rue de Rocroy, Paris, France; Ab. Sigfr. Anderson & Co., Malmo, Sweden; Leslie & Company, Perth, West Australia.

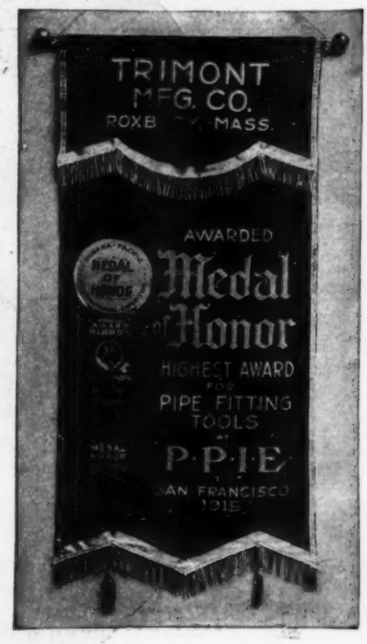
Panama-Pacific International Exhibit
San Francisco, 1915

The Exhibit

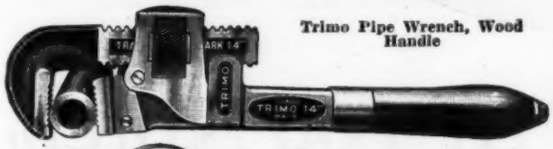


Highest Award for Pipe Fitting Tools

The Verdict



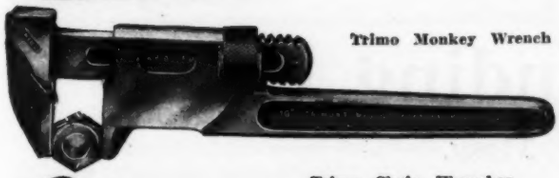
TRIMO TOOLS



Trimo Pipe Wrench, Wood Handle

Trimo Pipe Wrench, Steel Handle

Trimo Pipe Cutter



Trimo Monkey Wrench

Trimo Chain Wrenches

With Flat-Link or Cable Chain.

Nut with Nut Guards

Send for Catalog 75

Be sure to ask for the TRIMO Wrenches, both Pipe and Monkey. They are equipped with Nut Guards that prevent the accidental turning of the adjusting nut in close quarters, and with Steel Frames, in the principal sizes, that will not break.

Place a magnifying glass over the above and increase your orders accordingly.

Trimont Mfg. Company
55-71 Amory Street
Roxbury, Mass., U. S. A.

Keep Production At Top Notch

The Buda Co., Harvey, Ill., operates this Norton Grinding Machine night and day, grinding cam shafts for Buda truck and tractor engines. Only a machine of unusually staunch construction could grind work as accurately as this concern demands—and keep production at *top notch*.

This operator grinds shafts of various sizes, removing about .030-in. stock within .001-inch. His average is 4 shafts per hour, while 88 shafts are ground every 24 hours in this 10 x 50 Norton.

Norton Machines stand up under severest service—but that is only one of the many reasons for Norton popularity. Consult our Service Dept. on your trouble.

Norton Grinding Co.

Worcester, Mass.

Chicago Store, 11 N. Jefferson St.

Vonnegut Machinery Company, Indianapolis, Ind. **Robinson, Cary & Sands Company**, St. Paul and Duluth, Minn. **Manning, Maxwell & Moore, Inc.**, St. Louis, Mo. **Henry Prentiss Co.**, New York, N. Y.; Boston, Mass.; Buffalo, N. Y.; Rochester, N. Y.; Syracuse, N. Y.; Scranton, Penn. **The Moteh & Merryweather Machinery Company**, Cleveland, O.; Detroit, Mich.; Pittsburgh, Penn.; Cincinnati, O. **Eccles & Smith Company**, San Francisco, Calif.; Los Angeles, Calif.; Portland, Ore. **The Canadian Fairbanks Morse Company, Ltd.**, Montreal, Que.; Toronto, Ont.; Vancouver, B. C. **C. T. Patterson Company, Ltd.**, New Orleans, La. **Kemp Machinery Company**, Baltimore, Md. **W. E. Shipley Machinery Company**, Philadelphia, Penn. **English Tool & Supply Company**, Kansas City, Mo. **Alfred Herbert**, Coventry, England; Paris, France; Milan, Italy. **Post Van der Burg and Company**, Rotterdam, Holland. **The F. W. Horne Company**, Tokio, Japan. **Izanosskoff & Co.**, Petrograd, Moscow and Ekaterinburg.

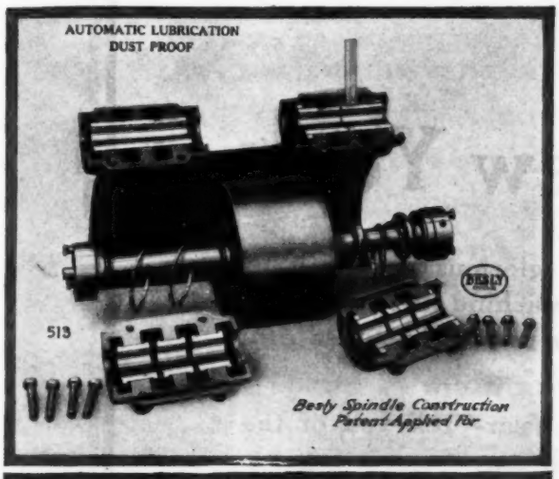
222N

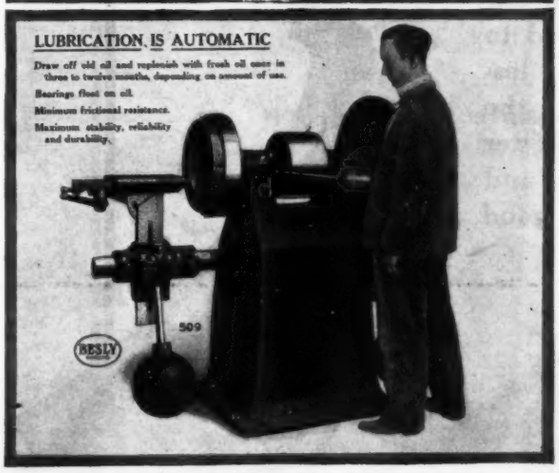
The Greatest Advance In Disc Grinding Design In Fifteen Years

Another *Exclusive* Besly Grinder Feature.

Automatic, Ring Oiling *Radial* and *Thrust* Bearings operating *successfully* at highest speeds with *all* end play taken up.

Dust Proof—Fool Proof.




LUBRICATION IS AUTOMATIC
Draw off old oil and replenish with fresh oil once in three to twelve months, depending on amount of use.
Bearings float on oil.
Minimum frictional resistance.
Maximum stability, reliability and durability.
509
BESLY

Maximum Stability.
Maximum Reliability.
Maximum Durability.
Minimized Frictional Resistance.
Minimum Attendance.

Insist on the BESLY for YOUR shop

BESLY
CHICAGO

Notes on Grinding

NORTON COMPANY,
WORCESTER, MASS.

No. 10-A

Cylindrical Grinding Practice

Depth of Cut, Speed of Work, Grade of Wheel

The faster the work revolution, the harder the wheel must be, whether roughing or finishing. The slower the work revolution, the softer the wheel must be, whether roughing or finishing. Slow work revolution, hard wheel and deep cut, causes the wheel face to load with steel, preventing the wheel from cutting. Relatively fast work revolution with soft wheel causes the wheel to wear away rapidly.

With comparatively slow work revolution, a soft wheel and deep cut the maximum amount of metal can be removed in the minimum time, with minimum wheel wear and power consumption.

The harder the material being ground the softer the wheel should be or the faster the work surface, or both. The softer the material being ground the harder the wheel should be, or the slower the work surface, or both. The larger the work the softer the wheel should be, or the faster the work surface, or both. The smaller the work the harder the wheel should be, or the slower the work surface, or both. The larger the work the longer the arc of contact between work and wheel.

To counteract the effect of longer arc of contact, the surface speed of the work must be increased. In fact the cutting action of the wheel can be controlled entirely by the work speeds. Relatively hard wheels are used for soft material and for small work, and softer wheels for larger work and harder material. By the use of the variable work speeds of grinding machines we can use the wheels graded for large, soft material on small, hard material, and vice versa.

The effect of work speed upon the cutting action of the wheel should be more fully understood. The popular idea that the work speed once established for any one piece of work will always be suitable for duplicates is erroneous for the following reasons:

It is impossible for the grinding wheel makers to guarantee to duplicate exactly the grade and cutting action of a wheel.

A small change of grade makes necessary a change of work speed, if we would secure the best cutting action of that wheel.

No two pieces of steel are exactly alike. It is probable that the variation of material that the wheel grinds is as great in its effect upon the results as are the variation from exact grade of the wheel.

A small change in the material makes necessary a change of work speed if we would secure the best cutting action of the wheel.

No grinding machine nor grinding attachment should be used without means for changing the work speed.

The work speed should be changed to get the best results as the wheel wears smaller, because when the wheel is worn only a little the cutting effect is changed. We should adapt the work speed to it from day to day, whether we are grinding duplicate work or a variety.

With work that is small and short, the time of grinding is so brief that with the work speed once found, grinding may continue profitable throughout an entire day without a trial of the work speed; but with work of medium and large size it should be tried and possibly adjusted to every piece, if we would secure the best results.

NORTON COMPANY

ELECTRIC FURNACE PLANTS
NIAGARA FALLS, N. Y. CHIPPAWA, ONT
NEW YORK STORE 151 CHAMBERS ST
CHICAGO STORE 111 NO. JEFFERSON ST.
NORTON

Slocomb

Now for a Happy New Year—

The dying year has been a glorious one—full of splendid achievement in the machine tool world. It has taught us all many lessons, too, of hastened production and heightened quality.

And now for a Happy New Year—relieved of the dark European menace which our industry and skill have helped to dissipate—turning war-time lessons to peace-time needs, with the assurance of better quality, better production, greater accuracy, and of the sure profit that follows good work well done.

J. T. Slocomb Company

Providence, R. I., U. S. A.

Representatives in England: Chas. Churchill & Co., Ltd., London, Birmingham, Manchester, Newcastle-on-Tyne and Glasgow.

Representatives in Italy: Chas. Civita, Milan.

Representatives in Japan: Alfred Herbert, Ltd., Yokohama.

Representatives in Australia: Edwin Wood Pty., Ltd., Melbourne and Sydney.

mb

As usual, in the vanguard of the Army of Accuracy, Slocomb Micrometers proudly hold their place. They will continue, throughout the world, to point the way to accuracy with speed — maintaining the reputation of twenty-nine years.

The Slocomb Measuring Book—with the Catalog, is ready for you. Write us for your copy.

The "D&W" Magnetic Chuck as used on a LE BLOND

Peace does not mean a breathing spell. It means speed and more speed. The "D & W" Magnetic Chuck is an essential for speed.

This photo was snapped in the shops of the Brierly Machine Company of Cleveland.

The "D & W" is holding a piece in place on a grinding job with a LeBlond No. 1.

The "D & W" is used in this shop to save time and maintain accuracy on universal work.

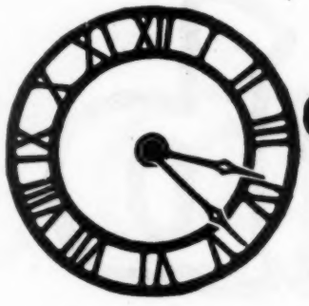
The Brierly people call it an "efficient time saver."

What chucking problems have you to contend with during these breathless days? We will be glad to advise you what the "D & W" can do for you.

Send for Circular No. 206-A

D & W Fuse Company

Providence, R. I.



Conserve Time!

TIME is an all essential element. Napoleon was defeated because his expected re-inforcements were behind time. Millions of dollars and thousands of lives are lost every year because men do not properly reckon with time.

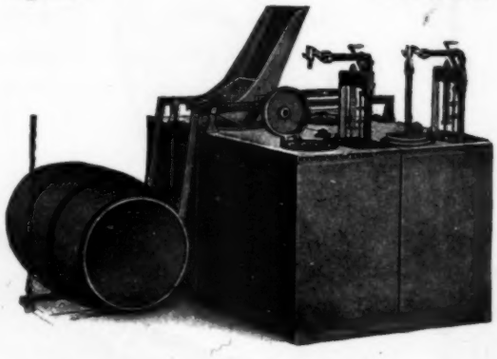
At the present as never before in history, time must be conserved to the utmost degree. Every minute must yield its greatest possibilities.

BOWSER ESTABLISHED 1885

Systems

for the storing and handling of oil, conserve more than half the time expended by less efficient methods. They also conserve:—

Labor **Lives**
Capital **Machinery** **Property**
Space **Material**



BOWSER SYSTEMS are leakproof, lossproof, fireproof, dirtproof, deterioration proof, evaporation proof, rapid, economical, and highly efficient.

A System for every requirement.

Write today.

S. F. Bowser & Co., Inc.

Ft. Wayne, Ind., U. S. A.

Sales Offices in All Centers **Representatives Everywhere**

Starrett

Test Indicators

DEPENDABLE TOOLS

Starrett Tools are known and recognized the world over as the most dependable tools for any accurate measuring operation.

Mechanics

rely upon them for important, accurate test work.

Dealers

carry them because they mean better satisfied customers.

Write for Our Catalog No. 21C.

It shows our complete line of tools in the many styles and sizes as well as hack saws.

Write for a copy today.

The L. S. Starrett Co., Athol, Mass.

The World's Greatest Toolmakers
Mfrs. of Hack Saws Unexcelled

New York **London** **Chicago**

42-863

BULLARD

Bullardize Your Production

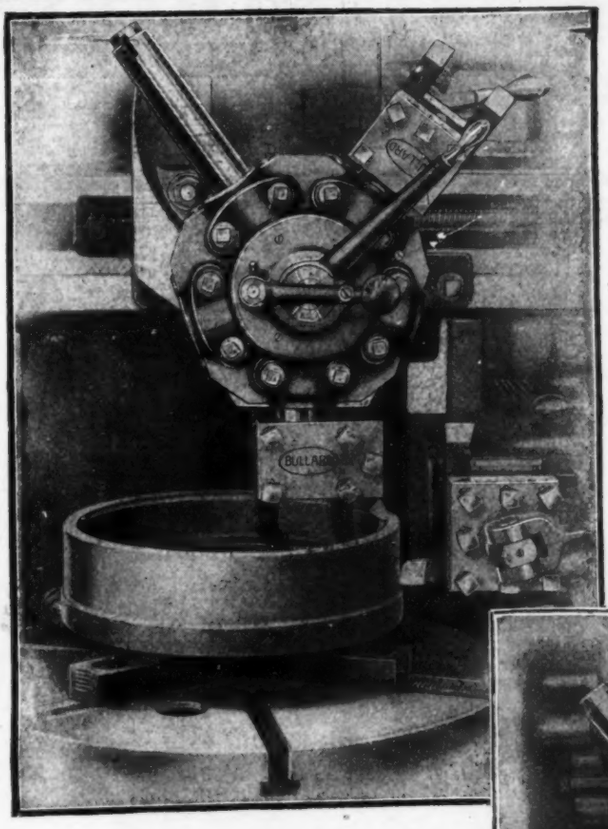
—in other words, put it on a basis of greatest profit per machine, per man, per foot of floor space—

The Bullard Vertical Turret Lathe

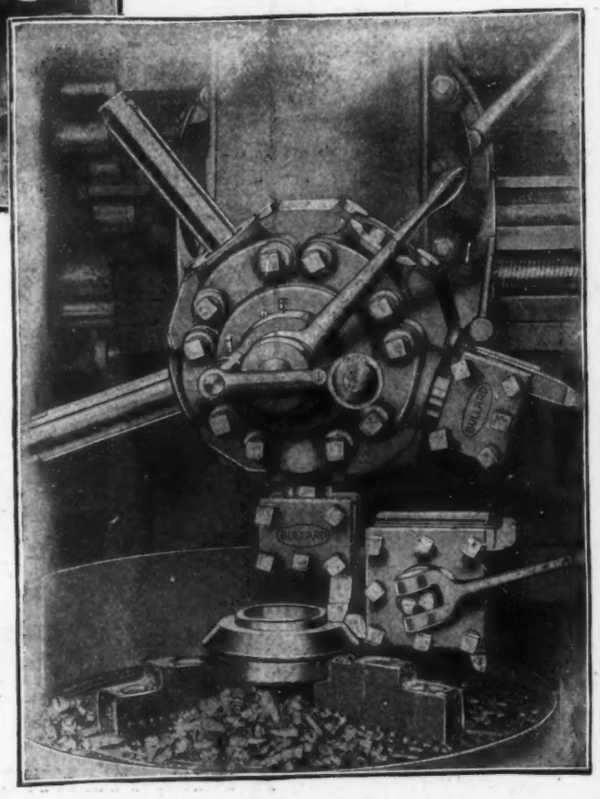
is always ready to do more than its share of a great range of work.

As to what that range covers, ask the Bullard engineers. If your work is included in Bullard Vertical Turret Lathe possibilities, we will give you full information covering a guaranteed production estimate, etc.

Bullard Machine Tool Co



CUTTING TIME BETWEEN CUTS



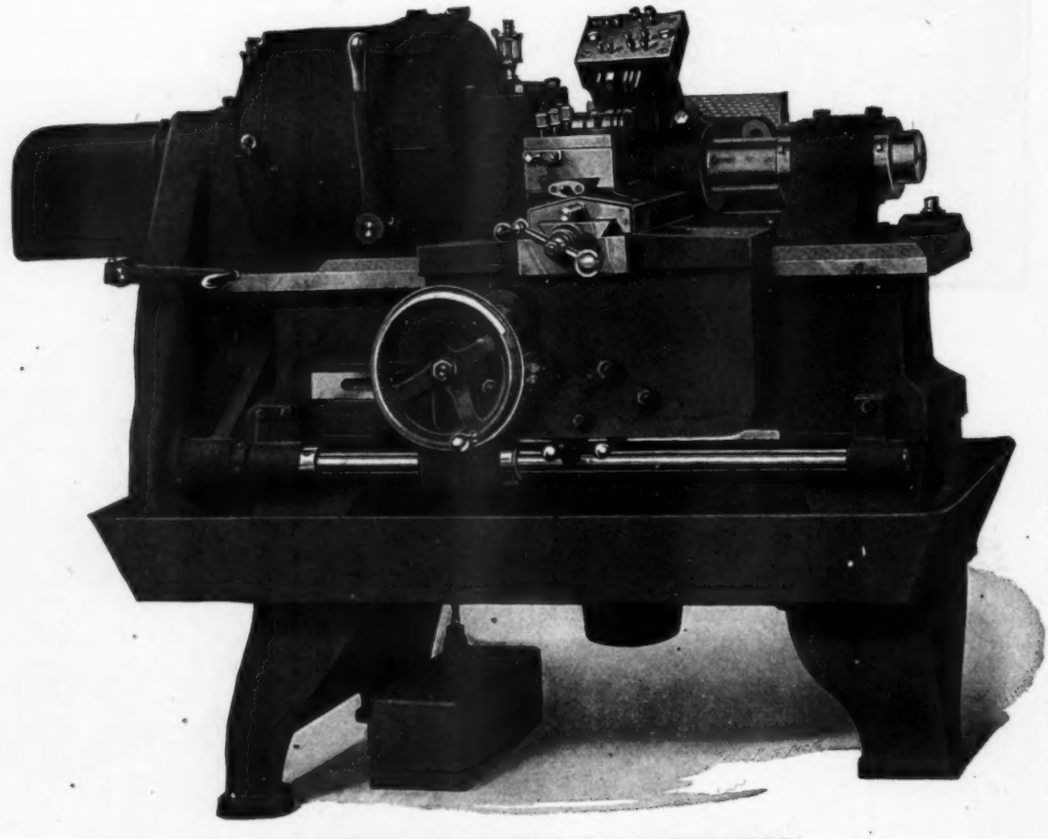
Deliveries Are Good

Sizes, 24-in., 36-in., 42-in., 54-in.

mpany, Bridgeport, Conn.

REED-PRENTICE COMPANY

WORCESTER MASS. U.S.A.

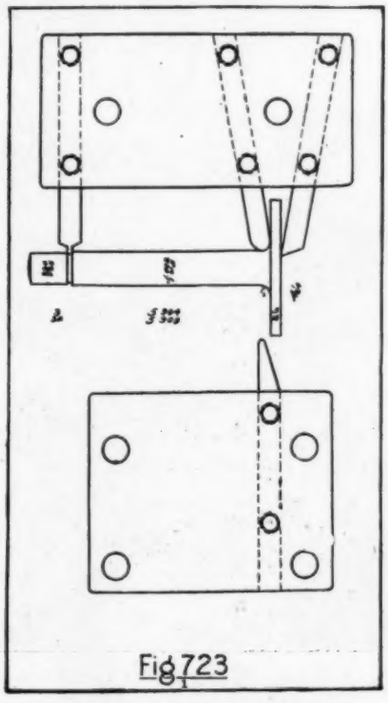


A REED-PRENTICE AUTOMATIC

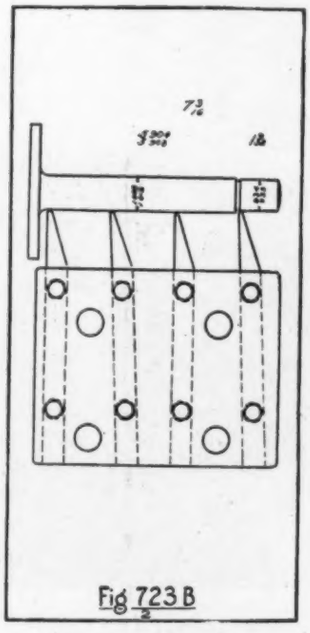
REED-PRENTICE COMPANY

WORCESTER MASS. U.S.A.

A TRANSMISSION DRIVE SHAFT



2 Back Tools Facing—Grooving.
1 Front Tool Turning.
Time—1 min., 30 seconds.



4 Front Tools Turning.
Time—45 seconds.

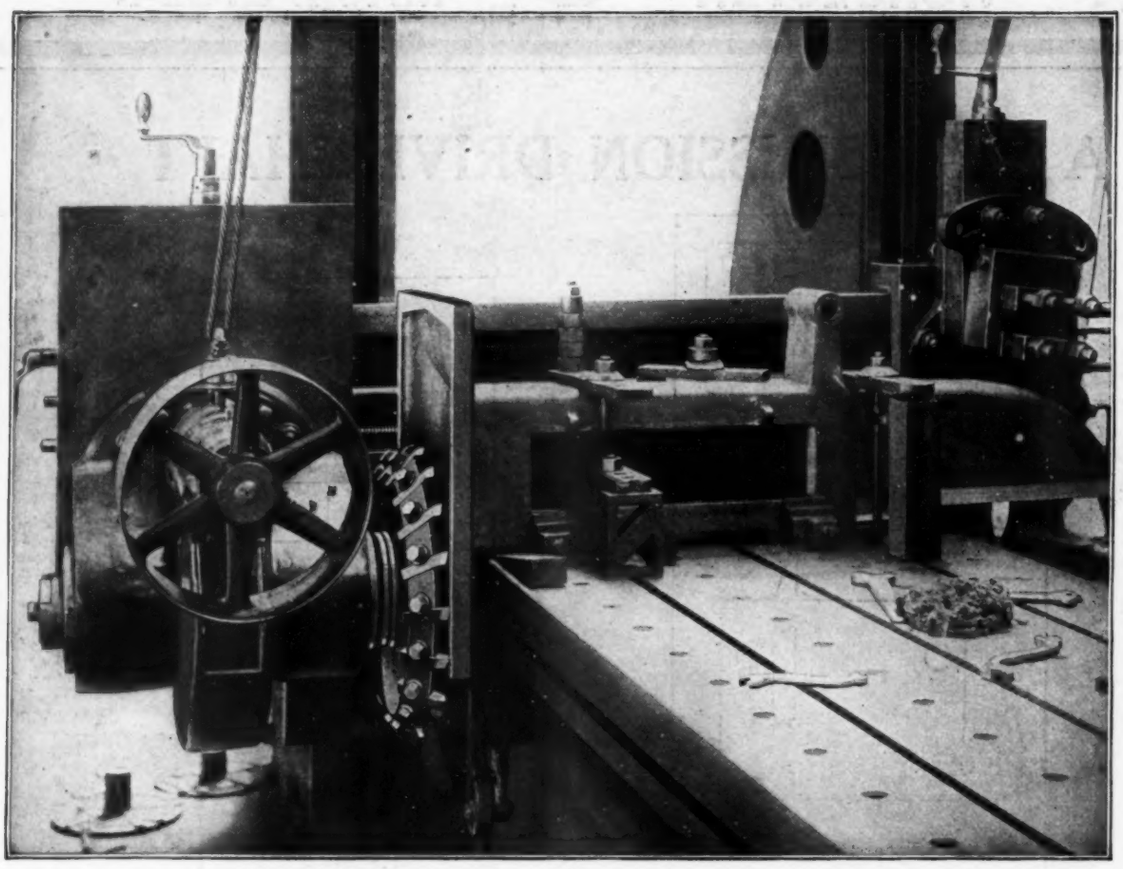
FROM A ROUGH FORGING TO A FINISHED PIECE IN 2 MIN., 15 SEC.

TWO MACHINES AT WORK AND A RECORD MADE IN PRODUCTION. THE TOOL SET UP IS SHOWN ABOVE.

OUR ENGINEERS WILL GLADLY SHOW YOU HOW THESE MACHINES CAN BE MADE TO SUIT YOUR REQUIREMENTS ON QUANTITY PRODUCTION.

MANNING, MAXWELL & MOORE, INC.
FENWICK FRERES
CANADIAN FAIRBANKS-MORSE CO., LTD.

Farwell Milling Attachment For Planers



Utility and Economy

Farwell Milling Attachments embody every desirable feature a tool could possibly possess. The most prominent of which are Utility and Economy.

UTILITY because they convert a planer to a Vertical or Horizontal Mill or Drill; and with the large bed of a planer will handle numerous jobs that cannot be handled on an ordinary mill or drill.

ECONOMY because of first cost as compared with the cost of Boring Mills or special machines necessary to handle many cumbersome jobs (that cannot be handled otherwise except with this attachment) and because it reduces the cost of performing many manufacturing operations. For instance in the above illustration is shown a No. 3 attachment facing the bottom of a heavy odd shaped stand with an 18-in. face mill. This operation would require an unusually large planer or milling machine, but is being done with much less expensive equipment, and in one fourth of the time.

Our catalog No. 57 describes in detail the various sizes and types and shows many operating views.

May we mail you a copy?

THE ADAMS COMPANY

1908 Bridge Street, DUBUQUE, IOWA

Hard bread supplied to the boys in the trenches had to be packed in tin containers to protect it from gas poisoning.

Hundreds of thousands of these tins of bread were shipped to France. The work had to be done quickly and perfectly, so of course, the baking companies used

"American Beauty" electric soldering irons

because they do the work easier, quicker, better

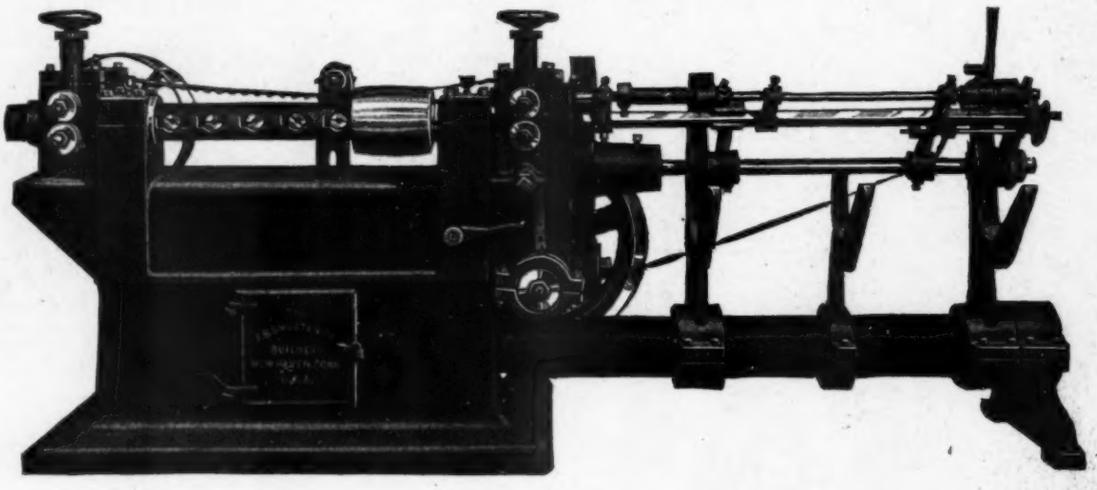
Wherever light to fairly heavy soldering operations are performed these irons will be found ideal

American Electrical Heating Company

Detroit, U. S. A.

Oldest and Largest Exclusive Makers **Established 1894**

Wire Is Perfectly Straight



And cut to accurate lengths when it comes from our

Automatic Wire Straightening and Cutting Machine

It makes no difference whether it's hard or soft wire, steel, brass, copper, special alloys, aluminum, iron, in fact the machine handles all kinds of wire with equal facility.

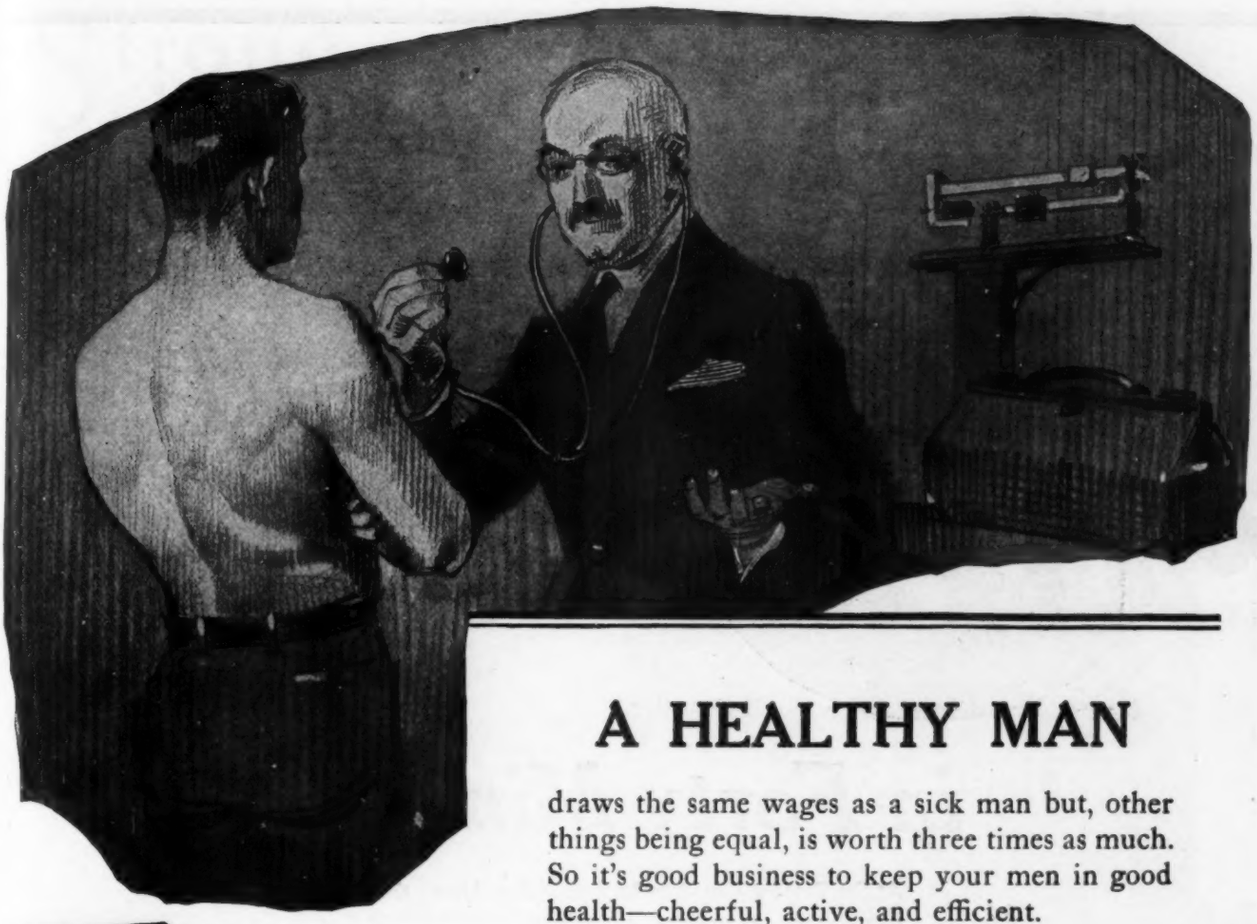
It is made in many sizes and lengths, and it turns out a good many thousand feet every day at very small cost for operation and maintenance.

Catalogue 41 *is yours for the asking.*

The F. B. Shuster Co., New Haven, Conn.

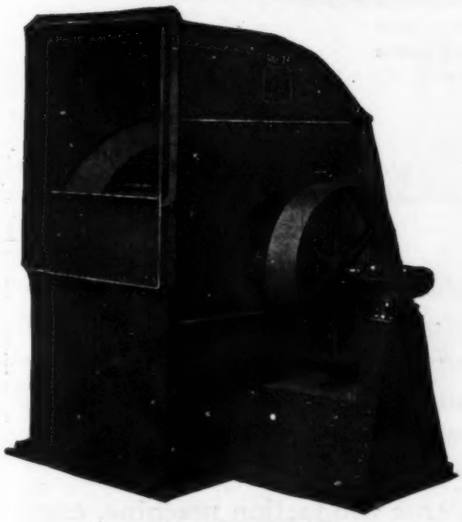
Formerly John Adt & Son ***Established 1866***

Also makers of Straighteners and Cutters for square and hexagon stock.



A HEALTHY MAN

draws the same wages as a sick man but, other things being equal, is worth three times as much. So it's good business to keep your men in good health—cheerful, active, and efficient.



"Sirocco Fan No. 7"

SIROCCO

equipment is a big factor in keeping men healthy at the plants of the Nash Motor Co., the Ford Motor Co., and others of national reputation. Our booklet, *"The Comfortable Shop for Efficiency"* tells how and why. May we send it?

AMERICAN BLOWER COMPANY

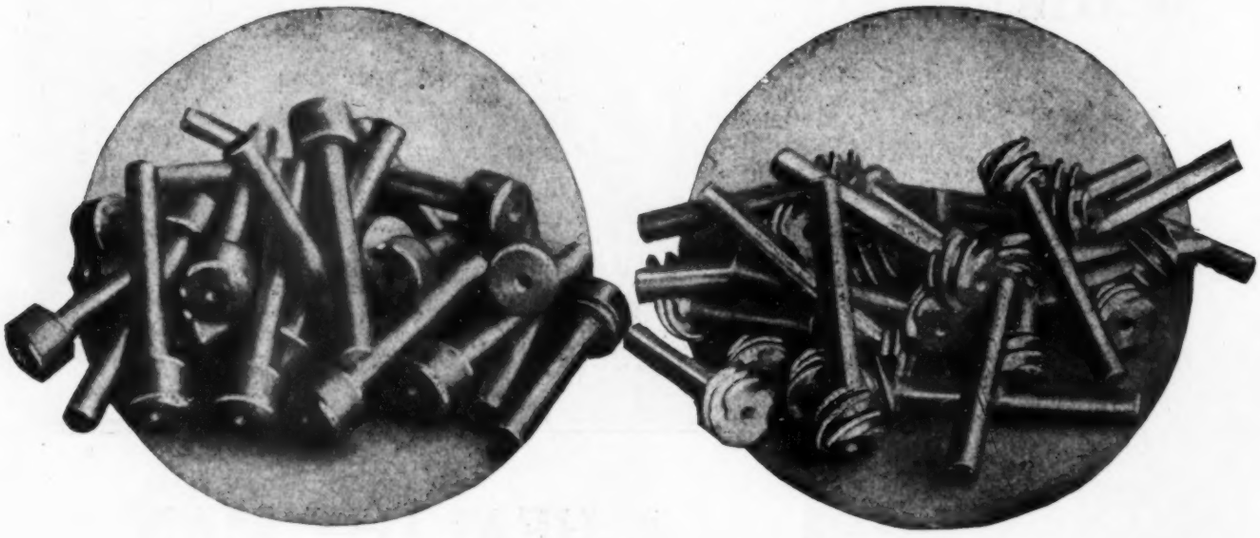
DETROIT, MICHIGAN

Canadian Sirocco Co., Limited, Windsor, Ont.

"Sirocco"

TRADE MARK

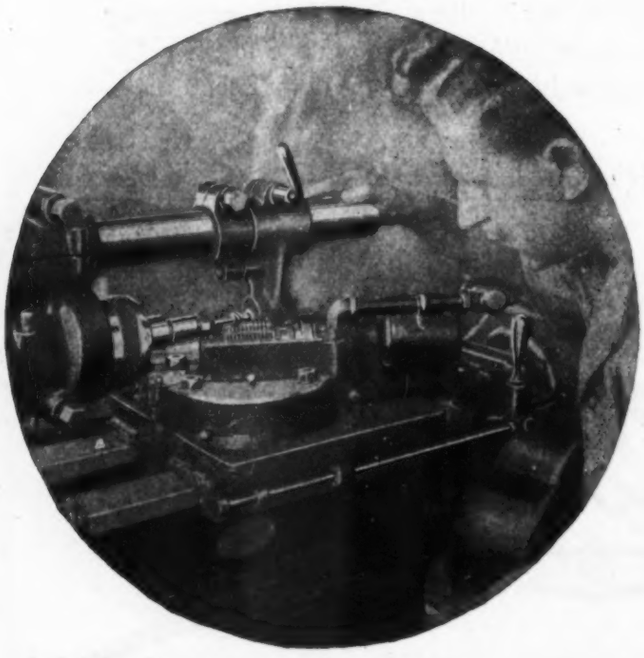
From This *to* This



in Forty Minutes

At the Crofoot Gear Works, Cambridge, Mass., they are hobbing spiral gears as shown in the photograph at from 25 to 30 per hour. The finished size, outside diameter is .6335 in. Limits, .001 plus and minus on pitch diameter. The machine used is the

No. 3 Barber-Colman Gear Hobber



This machine is capable of a wide range of sizes in the hobbing of spur, spiral and worm gears. The latter are generated through the use of the Vertical Feed Attachment.

This is a true production machine, capable of high output, while lending itself to quick and easy adaptation to the cutting of the various types of gears. The highest quality of workmanship throughout insures accuracy.

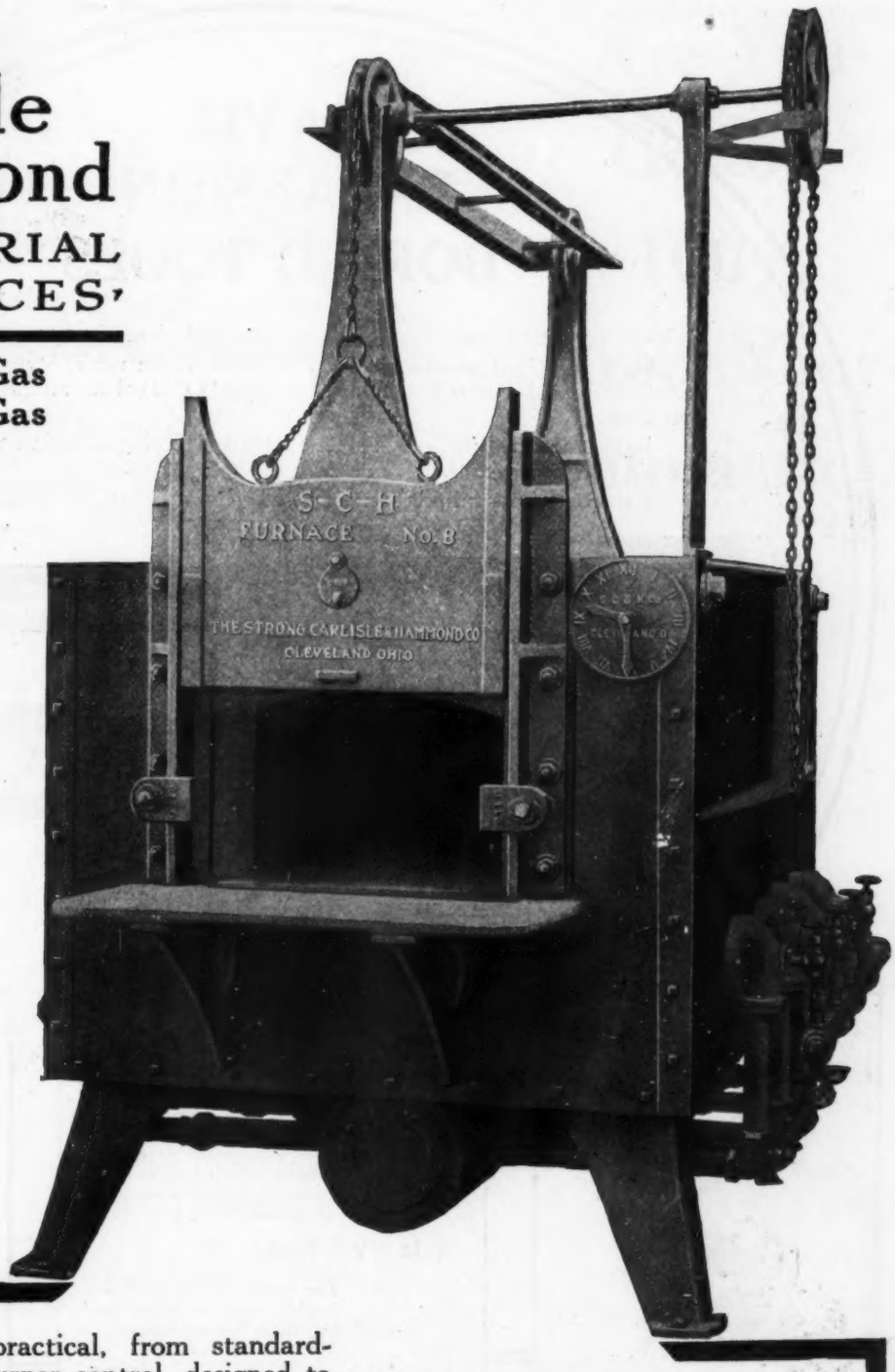
Barber-Colman Company

Rockford, Ill., U. S. A.

Strong Carlisle & Hammond

INDUSTRIAL FURNACES

For Oil, Natural Gas or Manufactured Gas



THOROUGHLY practical, from standard-shaped tile to burner control, designed to combine absolute accuracy with high capacity, quick to heat—even in temperature—easy to control, operated on oil, natural gas or manufactured gas, every Strong, Carlisle & Hammond furnace is not only designed for its particular purpose, but is equipped with every improvement recommended by actual working experience.

No. 8 for annealing and case-hardening, Counter-balanced, chain operated door, raised side tile floor.

Send for your copy of Catalog 8-A today—it's free.

FOR FAST DELIVERY CONSULT OUR FURNACE DEPARTMENT.

THE STRONG CARLISLE & HAMMOND COMPANY

FRANKFORT AVENUE CLEVELAND, OHIO

Boston New York Chicago ←BRANCHES→ Philadelphia Detroit Pittsburgh

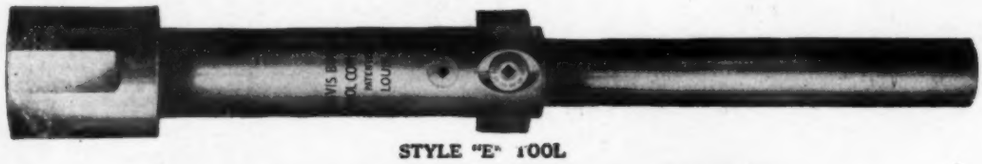
DAVIS EXPANSION BORING TOOLS

positively cannot be equaled for rapid, accurate and economical production.

Style "E" Tool is indispensable for Turret Lathe work, Style "V" for Turret Boring Mills and Turret Lathes, and our Style "O" Tool for all miscellaneous boring operations.

Apply these tools to your Turret Lathes and Boring Machines and save 25% to 50% in your boring costs.

Full particulars furnished on request.



STYLE "E" TOOL

STYLE "V" TOOL

STYLE "O" TOOL

Practical Micrometer Adjustment for Expanding Cutters

ALL DAVIS EXPANSION BORING TOOLS have an accurate micrometer adjustment for expanding the cutters to bore any size within range of expansion and also to compensate for wear.

This exclusive feature makes it possible to absolutely maintain any standard or odd size.

Style "E" Tool:

The unequaled production tools for turret lathes; hardened and ground pilots with oil grooves.

Style "V" Tool:

The rapid and accurate production tools for turret boring mills, turret lathes, or other boring machines.

Style "O" Tool:

The ever-ready tool applied to ordinary arbor or shank for miscellaneous boring or general manufacturing.

We make 16 different style tools in 16 different sizes.

ADDRESS DEPT. G

Davis Boring Tool Co.

Incorporated

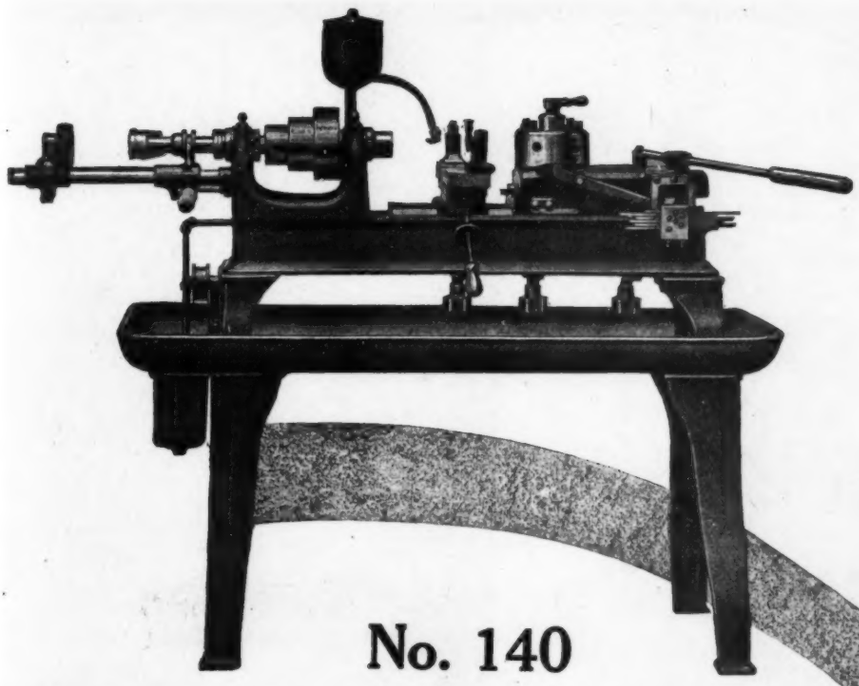
St. Louis, Mo., U. S. A.

Wedge Boring Expansion Cutters

Operating DAVIS EXPANSION BORING TOOLS solely with DAVIS CUTTERS insures maximum efficiency and production.

Our special facilities for manufacture and our highly specialized methods enable us to produce better cutters at a lower cost than you could produce in your own plant.

EXCLUSIVE MANUFACTURERS OF EXPANSION BORING TOOLS



Are You Getting 100% From Your Automatics?

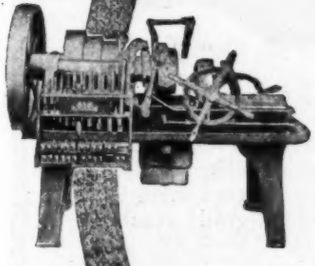
No. 140
"Wells" Hand Screw Machine

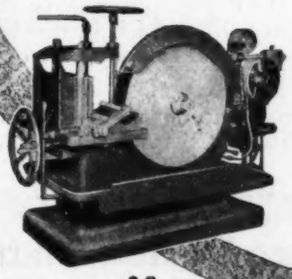
will enable you to cut out two or three of the slower operations and let the automatics run at top speed.

"Wells" Hand Screw Machines run by unskilled operators will handle efficiently these slower operations on small parts.

Result: Increased Production —Lower Costs.

A Trial Convinces.





Machine Tool Division

Greenfield Tap and Die Corporation

Greenfield
Massachusetts

The "STEWART" Heat Treating Prest-O-Lite Parts

Here you see a few of the various kinds of parts that the Prest-O-Lite Co. of Indianapolis is heat-treating in Stewart Furnaces. The requirements vary widely but the Stewart has the flexibility to meet them all —meet them in a manner that means uniformly high-grade results in every product.

The UNIFORM heat control and their ease of operation make Stewart Furnaces such economizers of time, material and money as no progressive company will overlook.

But of greater value than all these is the dependable quality that the "Stewart" helps to put into a product. SERVICE is the big idea behind Stewart Furnaces; and service is the ultimate result on which your products are judged.

There is a Stewart for every purpose and our 30-day try-out plan will prove that Stewart Service is the kind you need.

Write us today

Chicago Flexible Shaft Co.
162 Ontario St., Chicago, Ill.

Becker

Metal Slitting Saws

Made by Milling Specialists

A product of the Becker Small Tool Department, which is devoted to meeting the demand for milling cutters, saws and other tools of the Becker Quality.

These saws are reliable and dependable—for using anywhere a real fine accurate cut is desired. For slitting spring collets for turret lathes, slitting pipe, slotting screw heads, cutting off pieces of metal, etc., Becker Slitting Saws are invaluable.

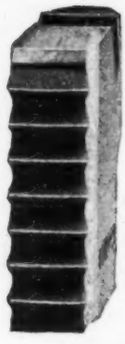
We are in position to make quick deliveries.

Tell us your small tool needs. The Becker Catalog is a valuable aid in the proper selection of saws and cutters for any kind of work.

Send us your name so that you may receive the Becker Monthly Stock List of Cutters.

The Becker Milling Machine Co. HYDE PARK, MASS., U. S. A.

AGENTS: Detroit Branch: J. J. Loftus, Mgr., 529 Majestic Bldg. The Whitman & Barnes Mfg. Co., 64 Reade St., New York. H. A. Smith Machinery Company, Syracuse, N. Y. E. L. Esseley Machinery Co., 551 Washington Blvd., Chicago, Ill. W. M. Pattison Supply Company, Cleveland, Ohio. New England Sales Agent: H. J. West, 10 High St., Boston, Mass.



Use This Murchey Solid Adjustable Hand Sizing Tap

to cut your threading costs

This Murchey Adjustable Tap is used extensively by firms who have a large quantity of threading staring them in the face and do not have a collapsible tap. This tool cuts cost of threading surprisingly and reduces the labor.

No such thing as "using up" a tap like this. You simply employ new chasers. And with new chasers and a slight adjustment you can easily bring the tap to size desired. Then too, you have the advantage of high speed steel cutting edge continually.

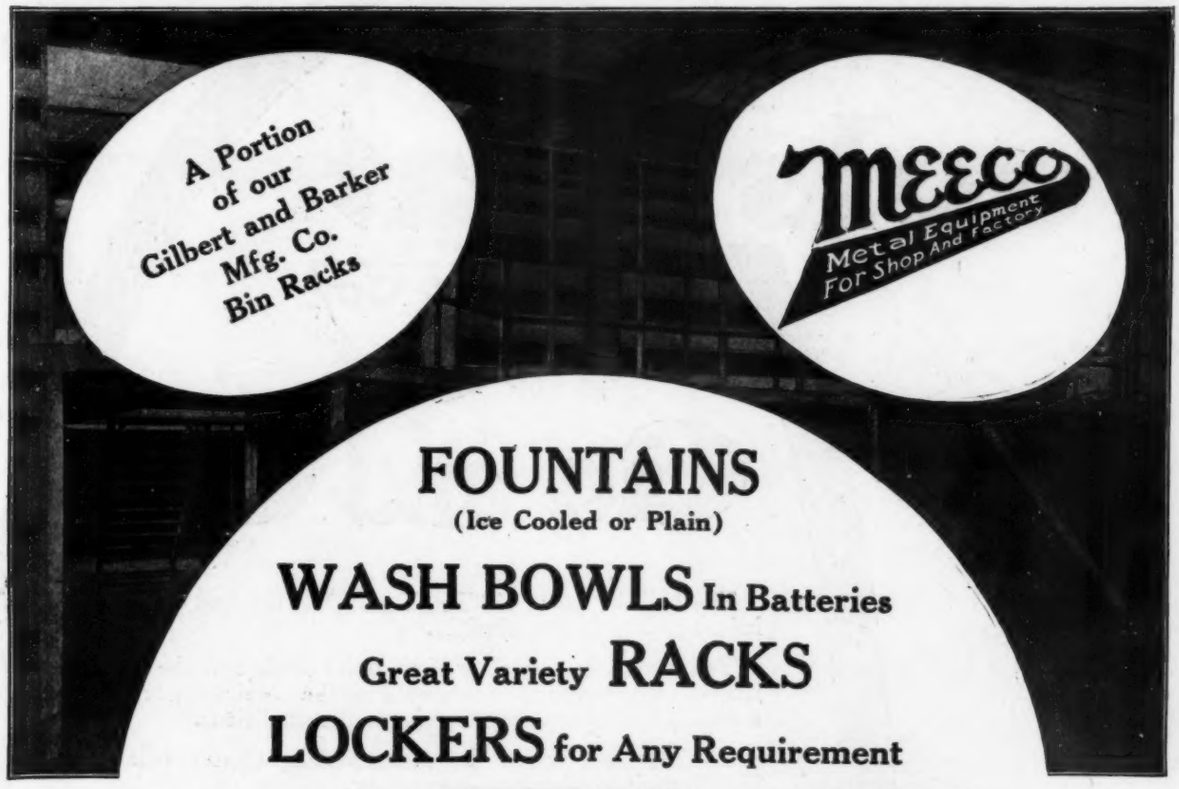
You can use it, too, wherever plain, solid taps have been used before. With it you can speed production immeasurably on your tapping machines, drill presses, monitor machines, boring mills, turret lathes.

Another thing—and this is especially valuable to those concerns who have been using this tool on munition work—you can convert it quickly from war-work to peace-work. By added chasers and a slight adjustment, it is good for any job at hand.

Send for the particulars about Murchey Tools. You will wonder why you had not used adjustable tools before.

Murchey Machine and Tool Co., Detroit, Mich.

Coats Machine Tool Co., London, Glasgow, Newcastle, England;
Fenwick Freres & Co., Paris, France.



FOUNTAINS
(Ice Cooled or Plain)

WASH BOWLS In Batteries

Great Variety **RACKS**

LOCKERS for Any Requirement

Indestructible **STOOLS** and **CHAIRS**

PLUMBING Fixtures

Manufacturing Equipment and Engineering Co.
136 Federal Street, Boston, Mass.
Works and Mail Address, Framingham, Mass.

OUR LINES
Washbowls, Metal Lockers, All Steel Stools and Chairs with Inset Wood Seats, Stock and Storage Racks, Metal Shelving, Metal Vault Fixtures, Improved Soda Kettles—40 and 60 gallons, Water Heaters and Instantaneous Mixers, Bubbling Drinking Fountains. Work Benches and Bench Legs, Drawing Stands and a full line of PLUMBING MATERIAL.
A Section of Pratt & Whitney Wash Room Furnished with our Bowls
Our Ice Cooled Fountain Fig. 604

Tools That

MADE IN GD & GD DETROIT MICH. U.S.A.

Go and Go

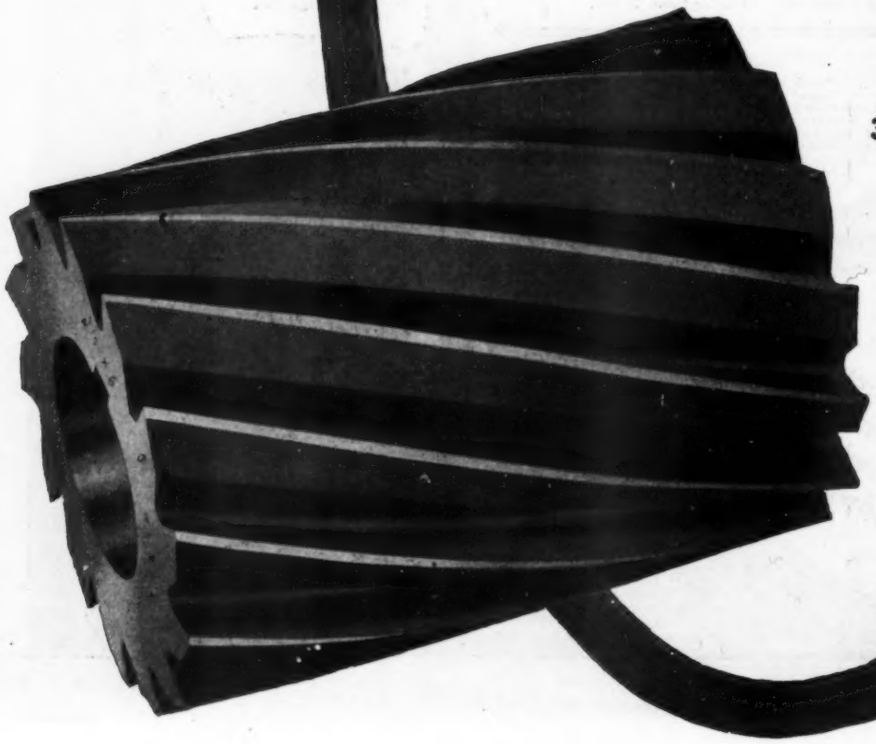
The built-in value of "The Tools That Go and Go" is heightened by **special design.**

The unsurpassed quality of material used, and the unrivaled workmanship are enhanced by the carefully worked out design which is varied to suit specific conditions.

For instance, notice the plain Milling Cutter below. Here is design which insures economy.

The strong, buttressed teeth, generous clip space and proper spiral tooth angle insure better cutting action, longer life, and provide for re-cutting or salvaging without greatly reducing working range.

We make all types of special and standard **profile** cutters and reamers—all properly designed; skillfully and accurately made; scientifically hardened.



Goddard & Goddard
39 Congress St., W.
Detroit, Mich.

Isn't This a Beauty?

A Vivid Patriotic Poster in Six Colors Sent free on request

The Message from France

THE CLEVELAND TWIST DRILL CO.

The 1919 Calendar of The CLEVELAND TWIST DRILL COMPA
CLEVELAND, O.

Strom BEARINGs

FORMERLY U.S. BALL BEARINGS

THE world's food production must be speeded up. War-pinched Europe must be fed. American farm efficiency must do much to shoulder the burden.

Strom Bearings are helping to make every fertile acre yield its full quota. In farm tractors they are increasing the nation's tilled acreage by practically eliminating power-destroying friction and reducing the cost of cultivation.

The war-time performance of Strom Bearings has caused them rightly to be considered standard equipment wherever dependable bearing service is required. In machine shops, tanks, tractors, motor trucks and airplanes they have met every bearing test most satisfactorily.

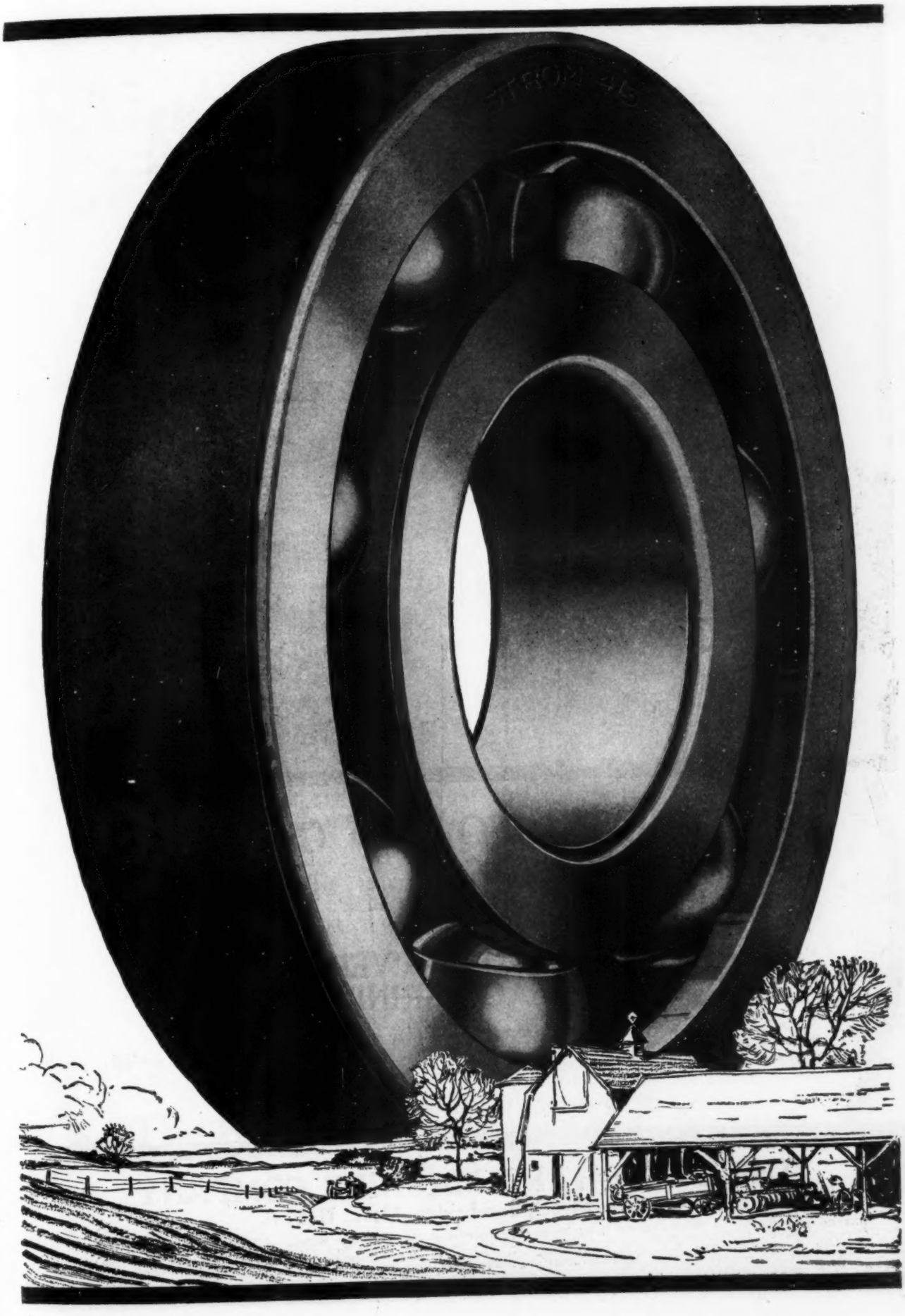
The balls are big, giving greater load-carrying capacity. The raceways have deep grooves with no notches to weaken them. The whole bearing is big and husky. It is built to perform at top efficiency over a long period of time.

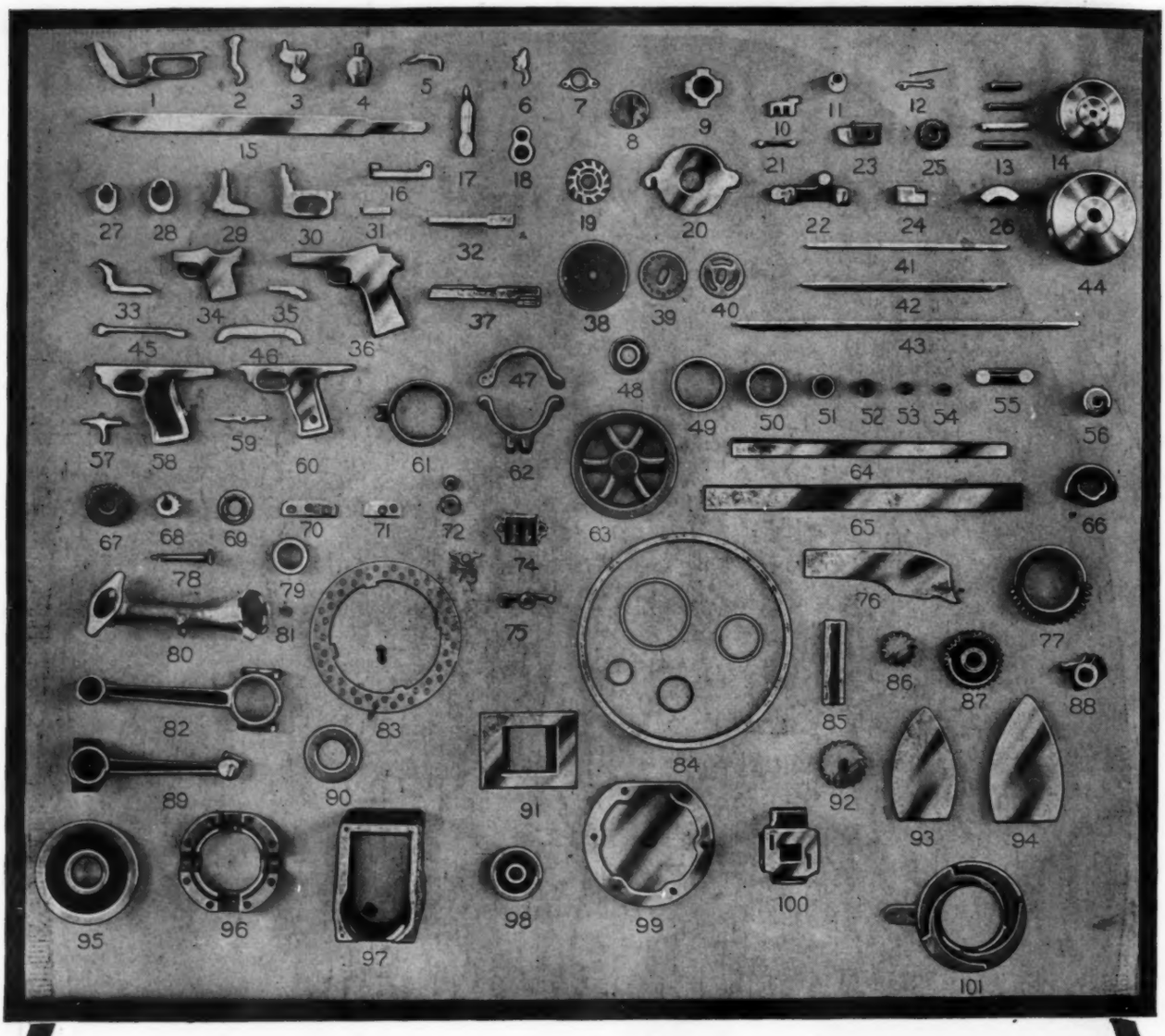
If you have a bearing problem to solve, you will find of material help booklets, "Calculating Bearing Loads" and "The Lubrication of Ball Bearings" which will be sent free, upon request.

U. S. Ball Bearing Mfg. Co.

(*Conrad Patent Licensee*)

Palmer Street and Kolmar Ave., Chicago, Illinois





Small Parts Quickly Ground

The rapidity of operation in manufacturing these articles is amazing. If you could do as well on certain small parts, wouldn't it cut your production costs considerably? We will send you the figures of what was done on a

BLANCHARD HIGH POWER VERTICAL SURFACE GRINDER

All but five of the pieces were chucked magnetically, thus saving fixture expense.
The rate of production is exceptionally high—in most cases several times faster than by methods formerly used—and made the work very economical.

Send your samples or blueprints today for estimate.

THE BLANCHARD MACHINE COMPANY

64 State Street, Cambridge, Mass., U. S. A.

UNITED STATES—Henry Prentiss & Co., Inc.; Motch & Merryweather Machinery Co.; Marshall & Huschart Machinery Co.; W. E. Shipley Machinery Co.; Kemp Machinery Co.; Robinson, Cary & Sands Co.; Pacific Tool Supply Co.
CANADA—Williams & Wilson, Ltd.; A. R. Williams Machinery Co., Ltd. **GREAT BRITAIN**—C. W. Burton, Griffiths & Co. **FRANCE**—Aux Forges des Vulcain. **ITALY, SWITZERLAND** and **BELGIUM**—Allied Machinery Co. of America.

BULLARD

The Mult-Au-Matic

for rapid, accurate, economical handling on a wide range of work

Adaptability in this machine has been considered by designing the tool heads so that they may be set to turn or bore on any angle from 0 to 360 deg.

This means you get the greatest possibility in range of work that may be done—a machine in no way limited.

When all the features—safety, independent tool head and work table operation, simplicity, etc.—of the Bullard Mult-Au-Matic are taken into consideration you have really reached an acme of perfection in station type vertical chucking machines.

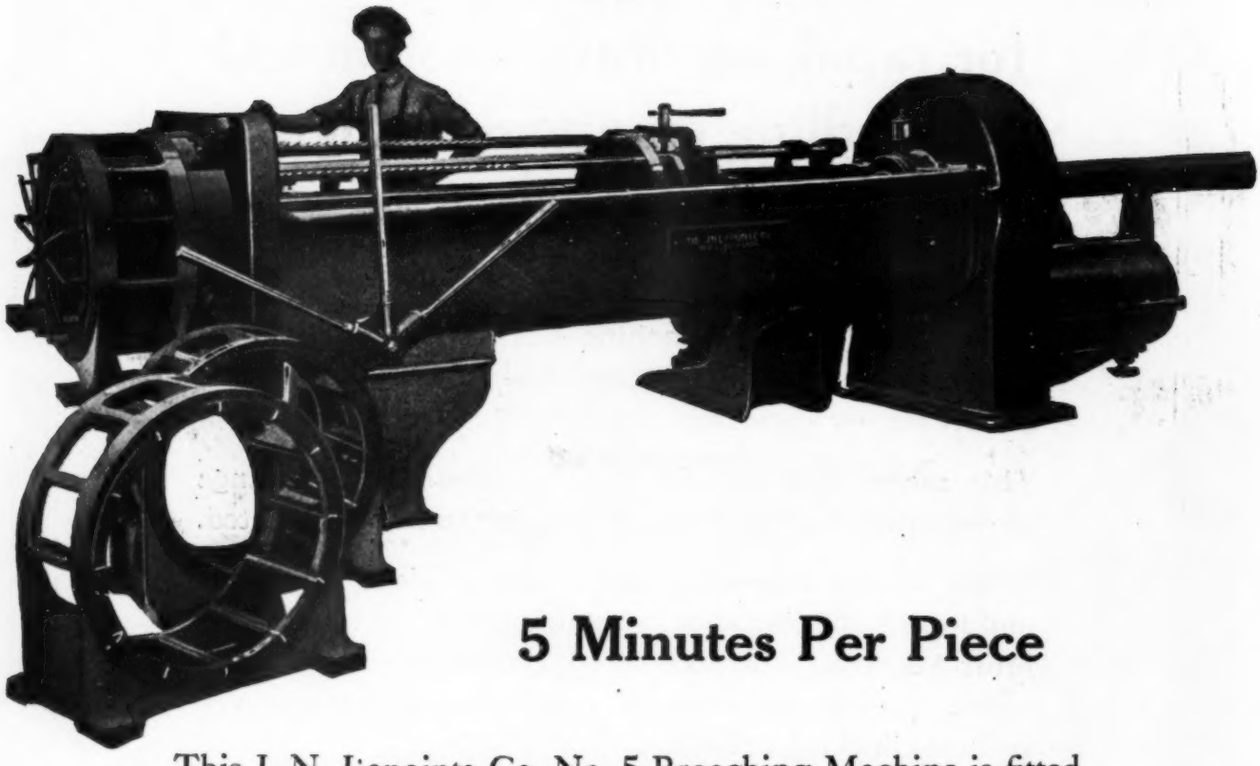
Let us give you time studies on some of the chucking work you are doing on horizontal type machines.

We believe a comparison will show a means of solving your production problem on work of this class.

The Bullard Machine Tool Company

Bridgeport, Conn.

Broaching Machines
for Big Work



5 Minutes Per Piece

This J. N. Lapointe Co. No. 5 Broaching Machine is fitted with motor drive, broaching twelve 3/8-in. x 14-in. grooves in one operation. Time: 5 minutes per piece. Undoubtedly it is the largest machine of this type ever built, and by reason of its unusually large dimensions, capable of broaching the heaviest work practicable in the broaching line.

Every part is especially heavy to accommodate the great weight of the whole machine. Triple operating handles are provided on each side to enable the operator to control the machine from the most convenient position. This machine can be furnished with countershaft when motor drive is not desired.

Investigate Broaching

J. N. LAPOINTE CO.
OF NEW LONDON, CONN.

Broaching Machines
for Quantity Production

60% Greater Output

A *J. N. Lapointe Co. Double Broaching Machine* requires but a single operator and gives approximately 60% greater output than a single machine.

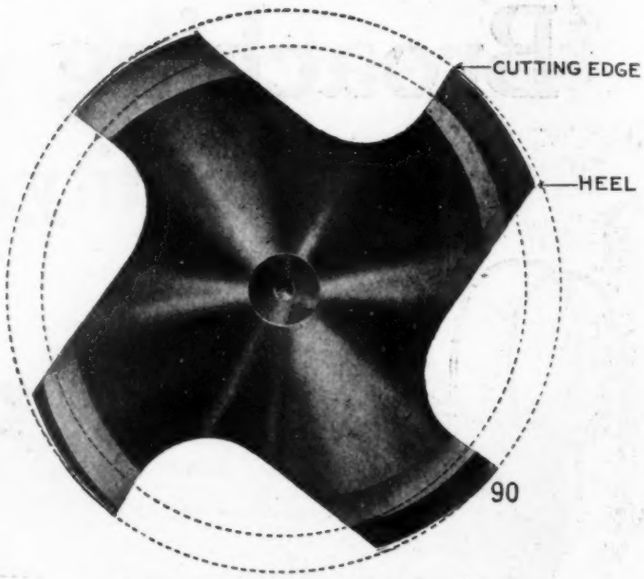
For large production of broached parts it is without question the most economical machine obtainable.

Our engineers are entirely at your command for the solution of your own particular broaching problem, whether it be large or small.

Write for J. N. Lapointe Co. Literature

J.N. LAPOINTE CO.
OF NEW LONDON, CONN.

The Original Machine Relieved Tap



Cross section of GTD hand tap showing Machine Relief. One-third of the tooth back of the cutting edge retains the full cutting size. The remaining two-thirds is relieved on top, bottom and sides.

REG. U.S. PAT. OFF.
GTD

For More Than Thirty Years

GTD Taps and their predecessors "Lightning" Taps have been manufactured with a scientifically correct form of thread, machine relieved to eliminate friction.

In view of the very apparent advantages of the Machine Relieved thread over other types it is not remarkable that it has been widely copied.

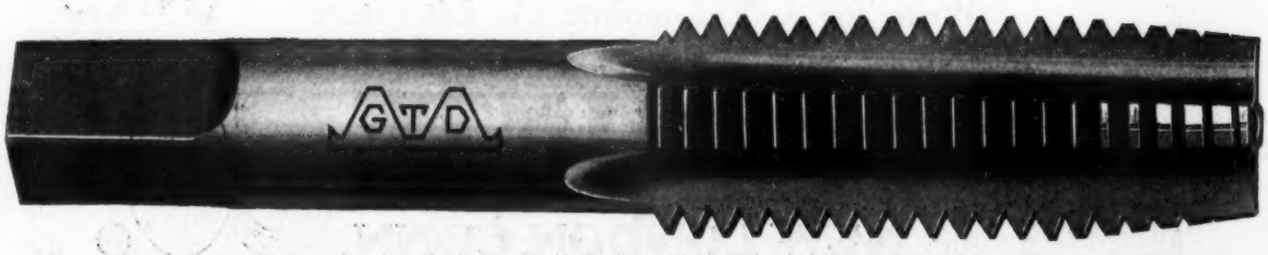
"Imitation is the sincerest flattery."

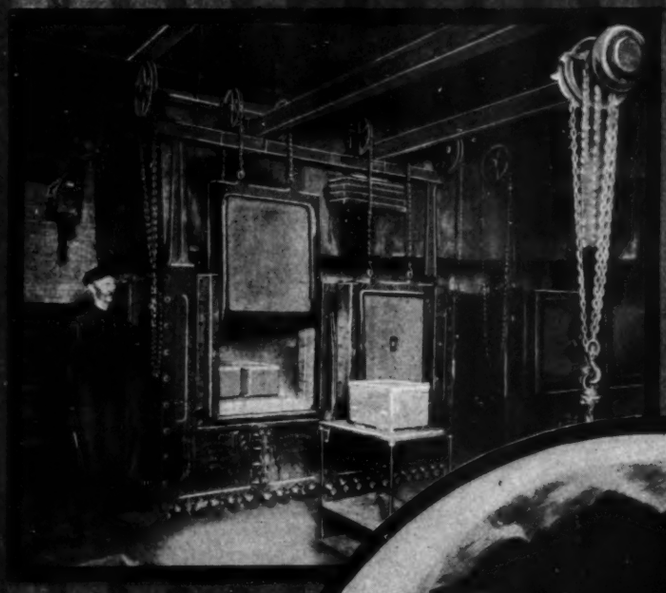
But beware of imitations—the GTD mark is your protection.

Greenfield Tap and Die Corporation

Greenfield, Massachusetts

New York, 28 Warren St. Chicago, 13 So. Clinton St. Detroit Office, 74 Congress St. W.
Canadian plant, Wells Brothers Company of Canada, Limited, Galt, Ontario





Upon the proper heat treatment of gears — clutches and axles depends the success of our motor transportation in France.

Going Back—*for a brief rest*

Without these powerful trucks, which "stand up" under punishment that they would never receive in commercial life, our Army would be helpless.

In building these trucks, there is no factor of greater importance than the heat treatment of gears—clutches and axles. That this is fully recognized, probably accounts for the fact that a list of users of Gilbert & Barker Gas and Fuel Oil Furnaces would include a fairly complete directory of the largest automobile and truck manufacturers in the United States.

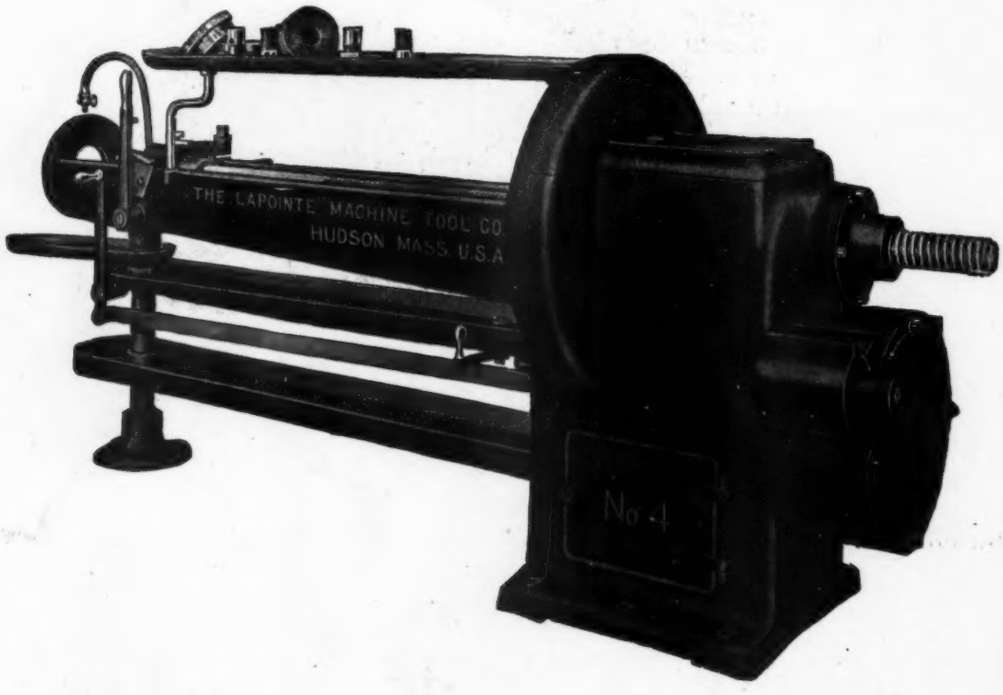
Our recently increased facilities make it possible to offer very prompt shipment. Your copy of Catalog 21 is ready. Say the word and we'll send it promptly.

GILBERT & BARKER-MFG. CO. SPRINGFIELD - MASS. U. S. A.

LAPOINTE of Hudson

Quantity production of duplicate parts with a hole in them, combined with reduced manufacturing costs, has made the name of "Lapointe of Hudson" the recognized standard in the broaching field.

60 an hour for keyway broaching, is the rule, not the exception, where Lapointe Broaching Machines are used.



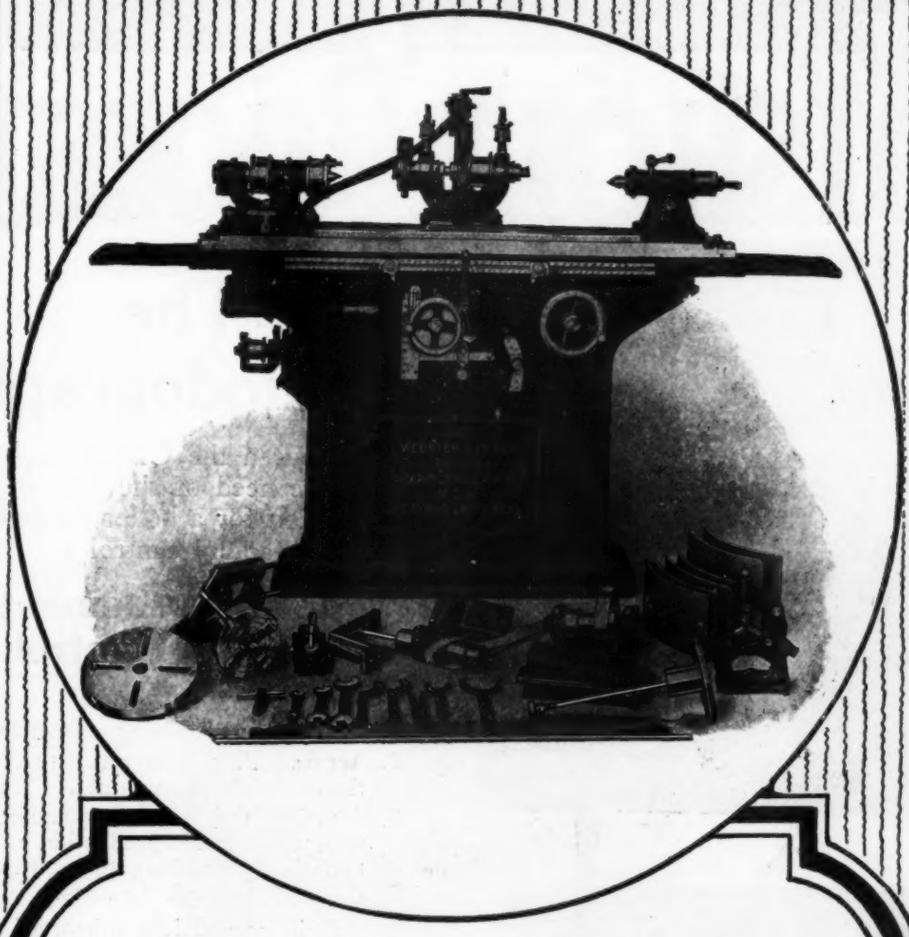
Catalog "C"
covers the subject fully—WRITE.

The Lapointe Machine Tool Co.

Hudson, Mass., U. S. A.

LAPOINTE

A Tool Room Necessity



W & P Heavy Duty Universal Cylindrical Grinder

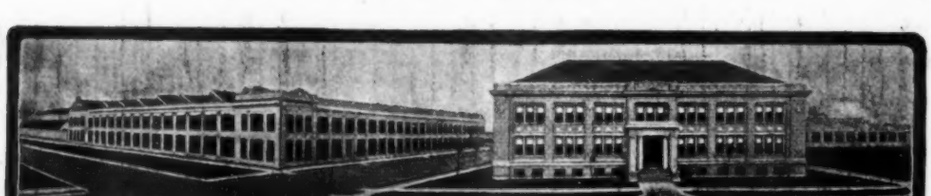
Embodies many exceptionally valuable features not found in other machines of this type. Rigid construction, with best of materials and highest class workmanship insures closest accuracy in all grinding operations. Limits of accuracy guaranteed to compare with any similar machine made by any manufacturer. Internal grinding attachment and counter bracket as well as dead center pulley are ball-bearing. Countershaft is equipped with Hyatt Roller Bearings throughout.

Automatic cross feed is simple, rigid, accurate and reliable—adjustable for feeding from .00025-in. to .004-in. by simply turning knurled nut.

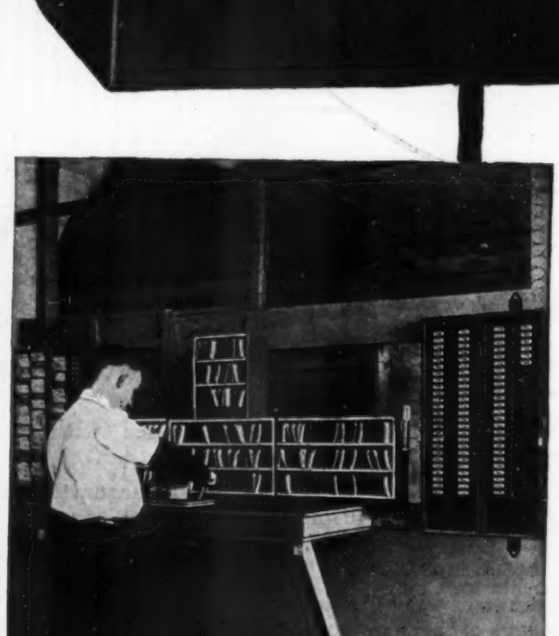
Fast and slow table travel obtainable by means of lever in front of machine with four-step cone pulleys on countershaft gives 8 table speeds—from 7-in. to 70-in. per minute.

Write for our Bulletin and learn how you can add efficiency to your grinding equipment.

THE WEBSTER AND PERKS TOOL COMPANY
SPRINGFIELD, OHIO, U. S. A.



A GISHOLT PRODUCT



The Periodograph

Designed in the Gisholt plant to meet the need of the Gisholt organization for a better method of securing factory control.

The Vital Elements of Shop Control

include these—

1. An accurate knowledge of attendance.
2. Accurate data from which to obtain the true costs of a product.
3. Securing the necessary equipment with which to aid production by systematically handling the routing of the work through the shop.

The Periodograph is a mirror of shop progress and performance. Periodograph time tickets reflect the true facts regarding the time spent on each factory operation and enable you to assume firm shop control based upon tangible data.

During the coming readjustment period nothing is of more importance to every manufacturer than giving the utmost consideration to these things.

Write for the Book "Better Factory Control"

GISHOLT MACHINE CO.

1163 East Washington Avenue
Madison, Wis., U. S. A.

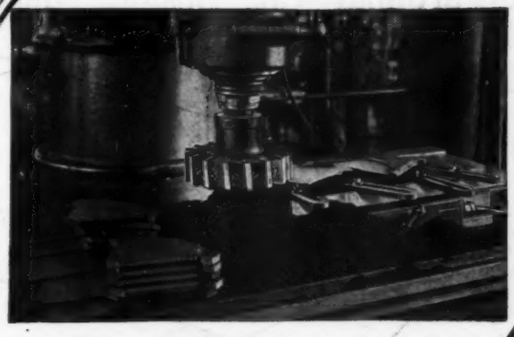
Builders of Standard and Automatic Turret Lathes, Vertical and Horizontal Boring Mills, Tool Grinders, Small Tools, Special Machinery, etc.

Eastern Sales Office:
30 Church St., New York
Works: **Madison, Wis.; Warren, Pa.**
Agent: **F. A. Thomas Company, San Francisco, Cal.**

Rectangular Magnetic Chucks

Our magnetic chucks embody an entirely new feature in Magnetic Chuck construction, namely—absolutely "insulated" magnetic energizing means and "No Leakage" of magnetism into the machine or cutting tools. This same chuck is adaptable to either 110 or 220 volts by a simple change in connections.

Simmons Uni-Pole Magnetic Chuck with plain face-plate for grinding.



Simmons Uni-Pole Magnetic Chuck in use on Milling Machine.

Simmons Uni-Pole Magnetic Chuck with T slot face plate for heavy grinding and use on Milling Machine or Shaper.

Important Features

Simple Construction.
Insulated Correctly.
Multiple Poles, Unit Coils.
More Holding Power by 40%.
Over Heating Impossible.
No Leakage of Magnetism.
Surface for Holding Completely Magnetized.

Our booklet describes them in full
Ask Your Dealer or Write for Catalogue 105A.

TAFT-PEIRCE
Woonsocket, R.I., U.S.A.

2049 **New York, Woolworth Bldg.** **Detroit, Majestic Bldg.**

LYND-FARQUHAR

Wall Radial Drilling Machine

This is a real machine tool. Careful design and high grade materials contribute to its great success and economy. The illustration below shows how well built it is.

Much wider range is possible on this drill than the ordinary radial. The head is exceptionally rigid. Yet it moves with extreme ease from end to end of the arm. For the crowded shop this drill is ideal, for it takes up little space, and when not in use can be pushed out of the way.

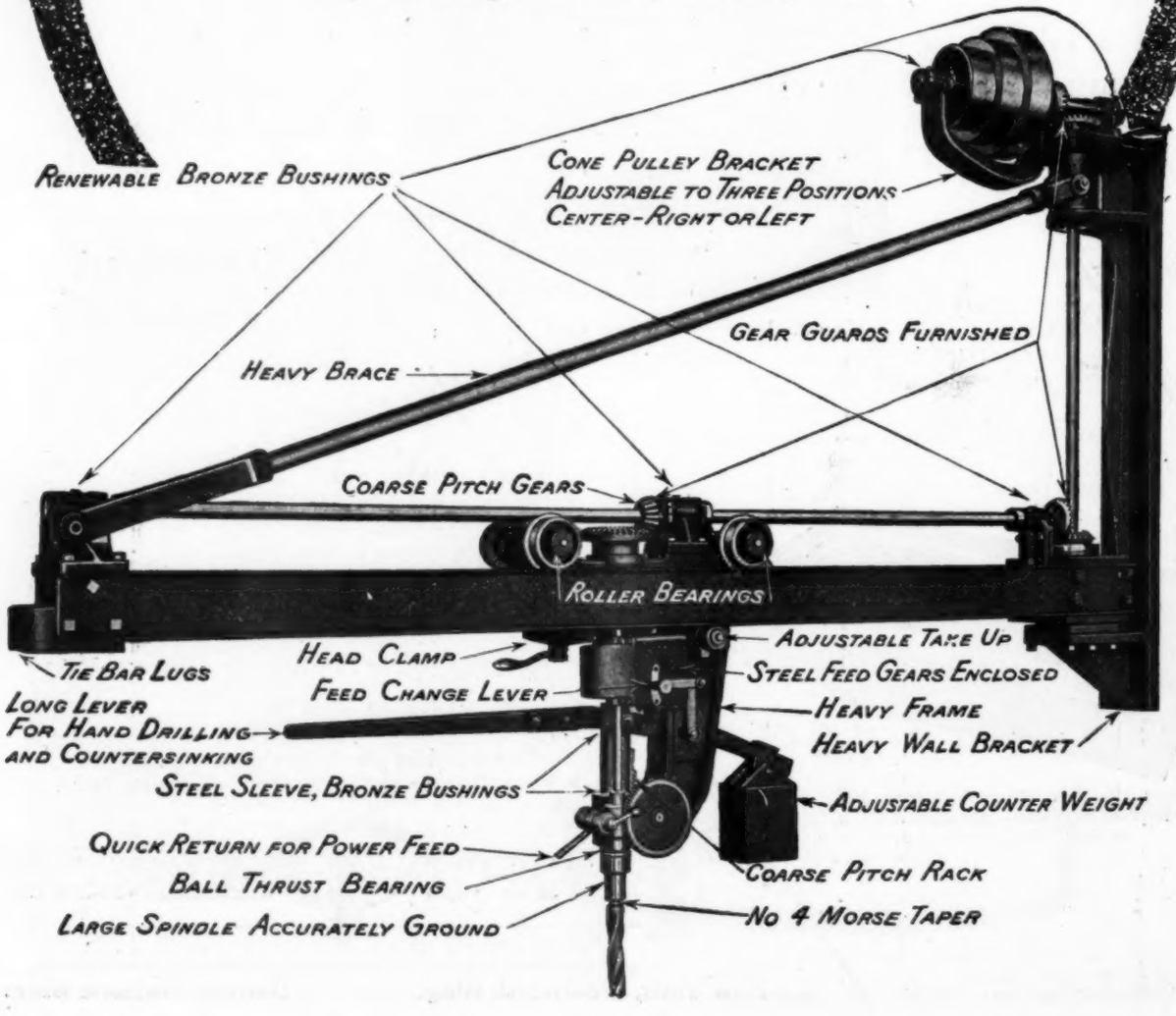
Made in four standard sizes:

Size	Drills to Center of	Wall to End of arm	Net Weight lbs.
7 ft.	14-ft. circle	10 ft. 4 in.	3380
9 ft.	18-ft. circle	12 ft. 4 in.	3483
11 ft.	22-ft. circle	14 ft. 4 in.	3615
13 ft.	26-ft. circle	16 ft. 4 in.	3750

Other special lengths of arm can be furnished to suit requirements.

Write us for complete information and prices.

Lynd-Farquhar Co., Boston, Mass.



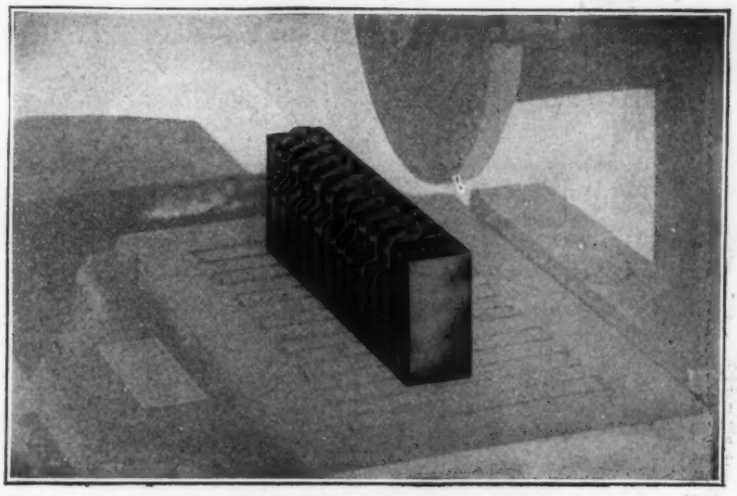
Time Saving Devices

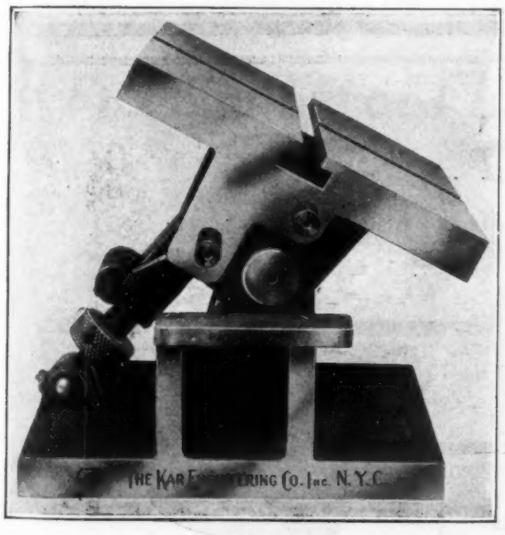
Karnetics

Karnetic Fixtures used on your Magnetic Chuck permit of instantaneous set-ups.

This cut illustrates how a quantity of irregularly shaped pieces can be ground in large numbers in one operation.

Send for catalogue and full description of these wonderful time-savers and how they can be applied to your work.





Sine-Angle Plate

This is an angle plate we have designed for direct sine measurement, by which angles can be measured within *one minute* and less, in any part of the quadrant, **without having to use protractor or sine-bar.**

This angle plate is so designed that with a single reading with a standard 2-inch micrometer, exact *angles* can be obtained.

Send for catalogue which explains just how this unique tool works.

Ready for immediate delivery.

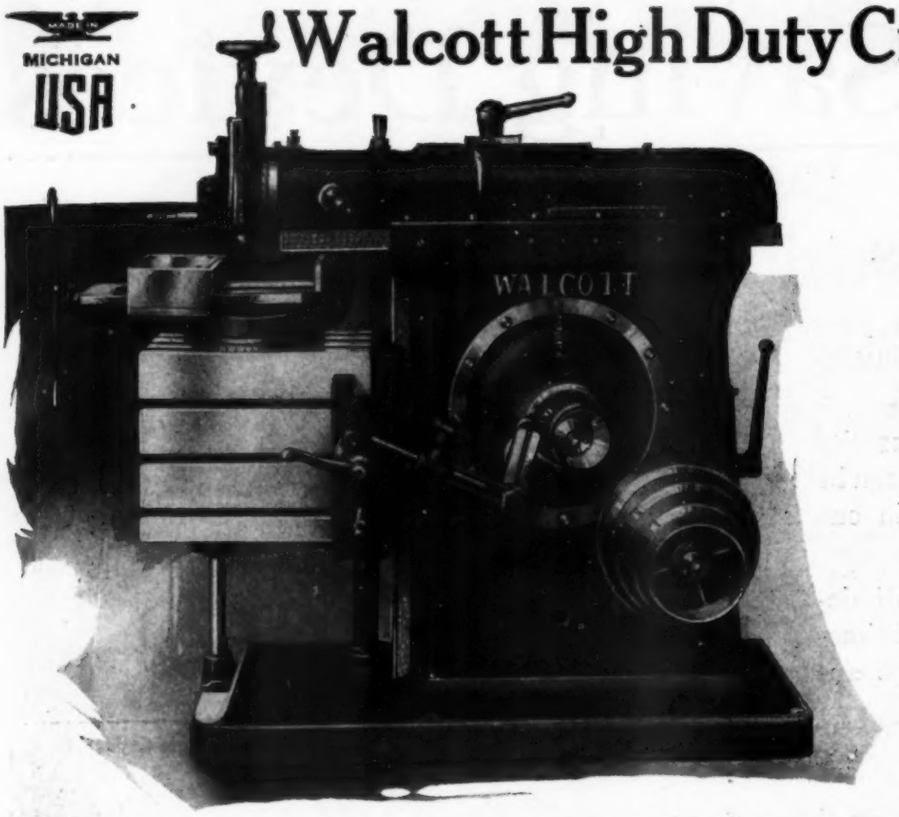
THE KAR ENGINEERING CO. INC.

MECHANICAL ENGINEERS AND MACHINE DESIGNERS
CONTRACT MANUFACTURERS AND BUILDERS
OF LIGHT MACHINERY, TOOLS AND METAL PR UCTS

79 EAST 130TH STREET, NEW YORK CITY

MADE IN MICHIGAN USA

Walcott High Duty Crank Shaper



For accuracy, ease of operation and general rigid construction, Walcott Shapers have never been surpassed and seldom equaled. The well-balanced design and the prevalence of steel throughout makes the Walcott the shock-proof shaper.

Helical Driving and back gears are made of steel and are of wide face. These gears insure a smooth running machine with an absence of chatter and an abundance of strength to withstand the heavy shocks shapers are often subjected to.

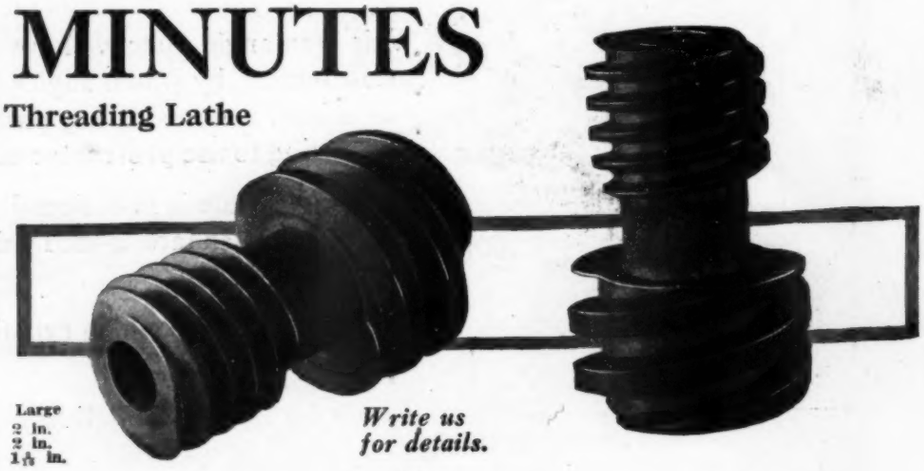
To know shaper quality is to know the Walcott details—**Write.**

Jackson Shaper Co.
Jackson, Mich., U. S. A.
Agents in all principal buying centers

FIVE MINUTES

on the Automatic Threading Lathe

to Cut this Cast Iron Worm



	Small	Large
Lead	½ in.	2 in.
Outside Diameter	1½ in.	2 in.
Face	1⅛ in.	1⅛ in.

Double Thread

Write us for details.

You will get accuracy, in addition to larger output—on all kinds of threading work, both internal and external. The automatic way of cutting threads is a guarantee of positive results—quality and quantity results at lower cost. One man can operate several machines at the same time—if the machines are "Automatics."

The Automatic Machine Co.

Bridgeport, Conn., U. S. A.

WALCOTT

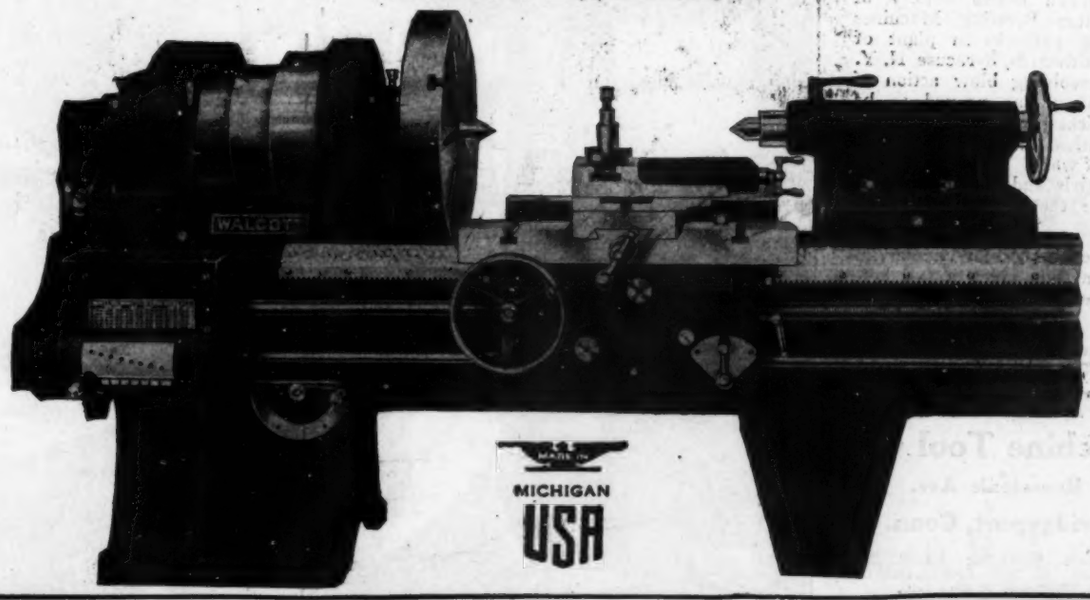
STANDARDIZATION AN ADVANTAGE TO PURCHASER

Standardization is just one of the many quality features of the Walcott Lathe. Every part of all "Walcotts" of the same type are interchangeable. Think of the saving of time and money in getting repair parts. Furthermore, standardization reduces our manufacturing costs which enables us to offer a superior tool at a reasonable price. At your request we will forward our catalogue, prices and delivery schedules promptly. Write today.

WALCOTT LATHE COMPANY

JACKSON 120 Calhoun Street Mich.

Walcott dealers in every prominent city.



The Choice of Five Nations

MADE IN MICHIGAN USA

After a careful study of all methods and machines pertaining to die-sinking, the United States, Great Britain, France, Italy and Japan all chose the Jackson Duplex Typeless Die Sinker.

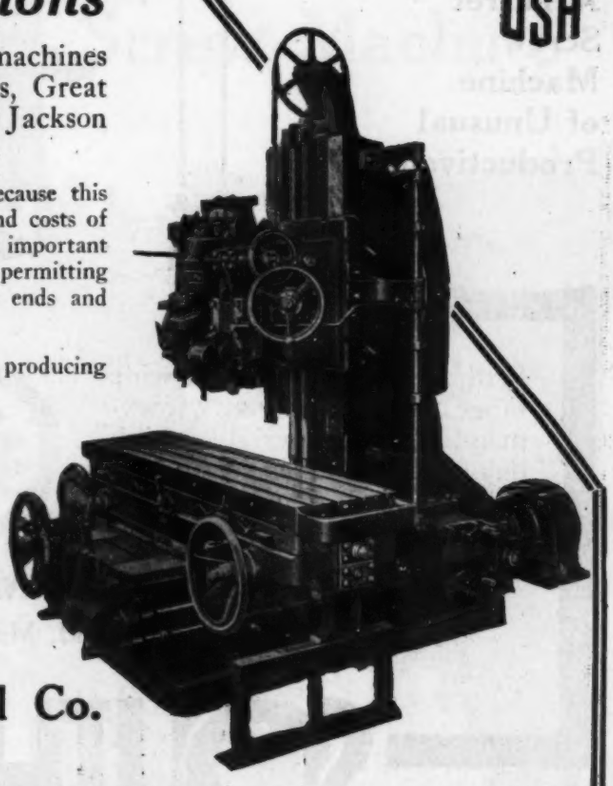
These wise buyers were justified in their selection because this machine has features of great importance to volume and costs of producing dies that are not found elsewhere. The most important of these features is the cherrying tool and mechanism permitting the sinking of semi-circular depressions with straight ends and without hand labor.

This machine wherever used has reduced the cost of producing dies from 30 to 90 per cent.
It completely machines and finishes dies up to 5000 pounds without hand labor.

Jackson Duplex Typeless Die Sinkers are made in three sizes varying somewhat in design to meet every requirement.

Details and description on request.

Cable: "DIESINKER JACKSON"



The Jackson Machine Tool Co.

Jackson, Mich., U. S. A.

Bilton Riveting Machines

High Production on Padlocks

Photograph shows battery of 10 Bilton Riveting Machines riveting padlocks in plant of O. M. Edwards, Syracuse, N. Y. The revolving blow action of the Bilton has proved to be the quickest and most economical method for their particular kind of work. Photo shows that even girls and young boys can operate these machines profitably.

The revolving blow action insures a tight rivet, a full hole and a good finished head.

Send for Catalog 10-G.

The Bilton Machine Tool Co.

Housatonic Ave.

Bridgeport, Conn.

FOREIGN AGENTS: Alfred Herbert, Ltd. M. Mett Engineering Co. Charles Churchill & Co., Ltd.

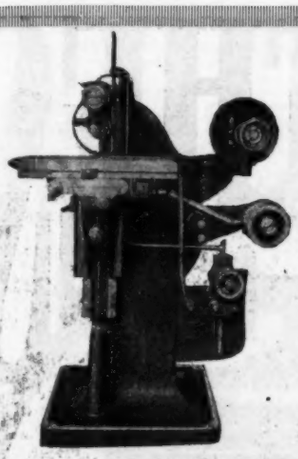
A Turret Screw Machine of Unusual Productiveness

With an extra heavy bed, a wide range of feeds and speeds, workmanship and material of high quality, this Turret Screw Machine has been found one of the most practical on the market today. If you want an efficient, lasting, economical machine, send for the Southworth details.

SOUTHWORTH MACHINE COMPANY

Portland, Maine, U. S. A.

SOUTHWORTH



One Girl Can Operate a Number of Machines

The labor shortage is an important factor in present day production. The Standard Power Feed Miller is so simple in construction and convenient in operation that one girl operator can take care of several machines.

For countless milling operations on small duplicate parts this machine will do the work with greater ease and rapidity than the more complicated and higher priced machines in general use.

STANDARD HAND MILLER

With Power Feed to Table

Four variations of longitudinal power feed by means of two interchangeable two-step feed cones. All gears are enclosed in housings and run in oil.

Equipped with the well-known "Standard" Box Type Knee—the rigidity secured assures accurate milling and maintains true alignment. Table has the full working surface of seven inches—affording ample strength and support for vises and fixtures.

Let us submit time estimates on your duplicate parts.

Standard Engineering Works, Pawtucket, R. I.

The Heaviest Demands Can't Strain

The Cone Automatic Screw Machine

The New Cone Automatic Four-Spindle Screw Machine is built to bear the ordeal of hard service. It's sturdy in every part. But besides rigidity, it possesses accuracy and convenience.

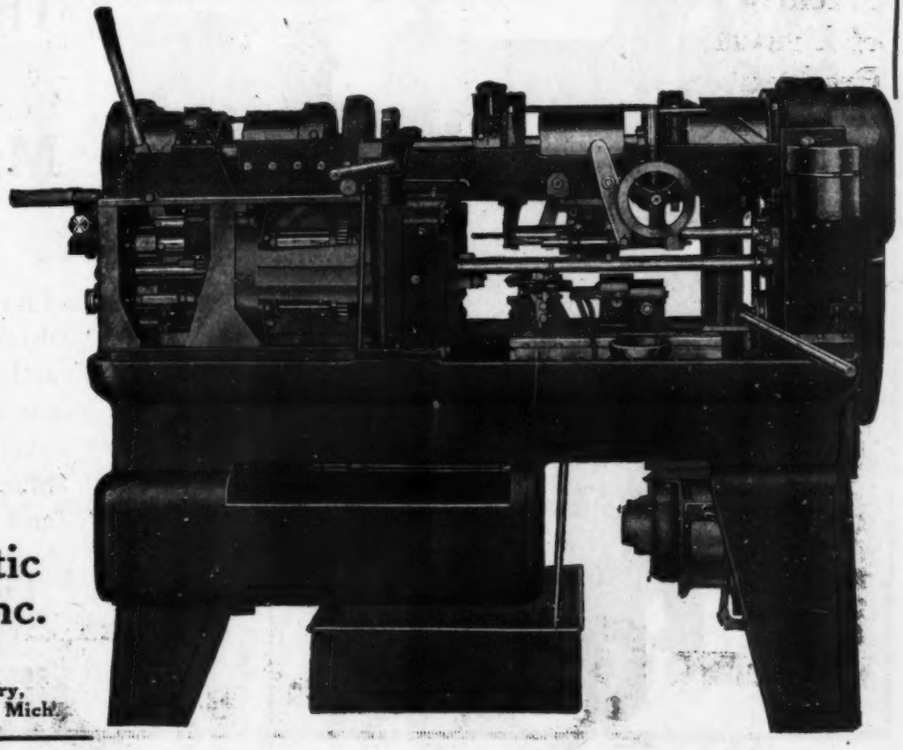
The cams and drums are overhead and away from the chips and easily accessible for setting up.

By our special arrangement the work is positively separated from the chips.

Spindles are hardened and ground and run in adjustable phosphor bronze bearings.

Has the widest tooling range.

Write us at once for complete information



Cone Automatic Machine Co., Inc.

Windsor, Vermont

Agent: Mr. J. C. Austerberry, 922 Dime Bank Bldg., Detroit, Mich.

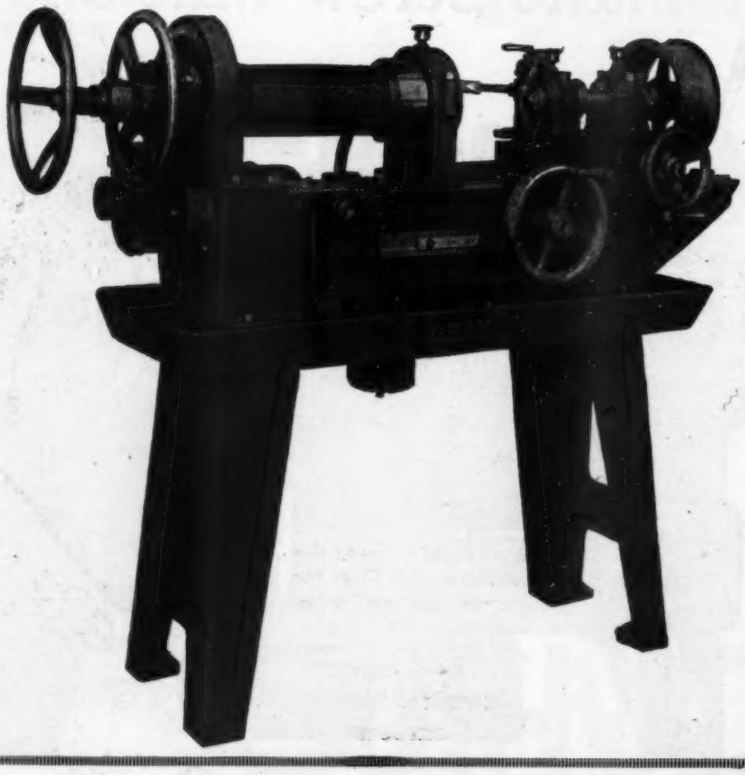
FLATHER LATHES

Special Features

Flather Lathes have many special features of value too numerous to mention here, but every one of them tend to greater production, ease of operation and a better working machine. We have a catalogue which tells you all about the many features. It will interest you—why not write for it today—now, while you think of it.

Flather & Company, Inc.
Nashua, N. H., U. S. A.

Here to stay:



GRAY
Thread Millers *for all* Manufacturing Purposes

Internal and external threads cut with accuracy and surprising speed. Work can *be held* in chuck or between centres. Send us your blue prints for quotation and production *estimate*.

The Gray Machine Tool Co., Inc.
2651 Main St., Buffalo, N. Y.

BRIGGS Heavy Duty Miller

This is the miller to use for the new era that is now coming to the world.

Competition is going to be pretty stiff, no doubt, in the days ahead.

Briggs Heavy Duty Millers will help you hold your own against all competitors.

These millers are primarily production machines. In addition to being record breakers, they are extremely economical in upkeep.

Investigate the Briggs without further delay.

Gooley & Edlund, Inc.

Cortland, N. Y.

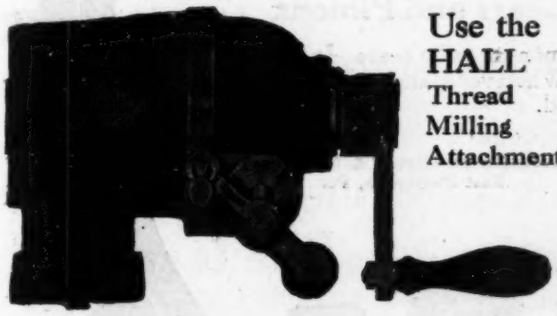
DOMESTIC AGENTS: The Cleveland Tool & Supply Co., Cleveland, Ohio; Bowman-Blackman Machine Tool Co., St. Louis, Mo.; Chandler & Farquhar Co., Boston, Mass.; Vandyck Churchill Co., New York, N. Y., and New Haven, Conn.; Swind Machinery Co., Philadelphia, Pa.; Syracuse Supply Co., Syracuse, N. Y.; O. R. Adams, Rochester, N. Y.; Brown & Zortman Machinery Co., Pittsburgh, Pa.; English & Miller Machinery Co., Detroit, Mich.; Federal Machinery Sales Co., Chicago, Ill., Vonnegut Machinery Co., Indianapolis, Ind. FOREIGN AGENTS: Barcelona, C. W. Burton, Griffiths & Co., Ltd., London, Manchester and Glasgow; Andrews & George Co., Tokyo.

OVER-SEAS REPRESENTATIVE

ALMACOA ALLIED MACHINERY COMPANY OF AMERICA 120 BROADWAY, NEW YORK, U.S.A. ALMACOA

Paris, Turin, Zurich and Barcelona

For Duplicate Threading



Use the HALL Thread Milling Attachment

We'll gladly show you how it can be best adapted to your requirements.

This machine is exceptionally fast for duplicate thread milling. And besides being fast, it is a "quality miller." This machine has established in many factories the enviable reputation of increasing production 50%.

Let us solve your milling problems for you. *Write.* We'll answer with RESULTS.

The Hall Gas Engine Co.

Bridesburg, Philadelphia, Pa.

PICK CLOVER For Your Lapping Jobs

You've picked a winner if it's Clover Lapping Compound. This is the compound that found the automobile industry too small for it. It was destined to find its way into the machine shops and big tool makers. Seven grades are now on the market—from very fine to very coarse.

1,600,000 cans were sold last year.

A sample is yours for the asking. Clip the coupon and mail it today.

The Clover Manufacturing Company

Norwalk, Conn.

To Clover Manufacturing Co., Conn.
Drawer F—Norwalk,
Kindly send me a sample can of your
Clover Lapping Compound.
Name .....
Position .....
Company .....
Address .....

Make Your Gears Co-operate-

LICENSED JOBBERS

Braun Machine Works, Brooklyn, N. Y.
A. & F. Brown Co., Elizabethport, N. J.
Cincinnati Gear Co., Cincinnati, O.
Crofoot Gear Works, Boston, Mass.
Rodney-Davis, Philadelphia, Pa.
Earle Gear & Machine Co., Philadelphia, Pa.
Foote Bros. Gear & Machine Co., Chicago, Ill.
William Ganschow Co., Chicago, Ill.
Grant Gear Works, Boston, Mass.
Horsburgh & Scott Co., Cleveland, O.
D. O. James Mfg. Co., Chicago, Ill
W. A. Jones Foundry & Machine Co., Chicago, Ill.
Meisel Press Mfg. Co., Boston, Mass.
Michigan Gear & Engineering Co., Detroit, Mich.
Moore-Handley Hardware Co., Birmingham, Ala.
Newark Gear & Machine Co., Newark, N. J.
New Process Gear Corp., Syracuse, N. Y.
R. D. Nuttall Co., Pittsburgh, Pa.
Pacific Gear & Tool Works, San Francisco, Cal.
Philadelphia Gear Works, Philadelphia, Pa.
Pittsburgh Gear & Machine Co., Pittsburgh, Pa.
The Simonds Mfg. Co., Pittsburgh, Pa.
Turley Gear & Machine Co., St. Louis, Mo.
The Van Dorn & Dutton, Cleveland, O.
Woburn Gear Works, Woburn, Mass.
Carpenter-Tew Gear Company, Brooklyn, N. Y.
Western Gear Works, Seattle, Wash.
Beacon Gear Shop, Worcester, Mass.
Albaugh Dover Co., Chicago, Ill.

Every mesh of metal gears results in a grind and a clang that expresses the dissension between them. Every mesh of metal gears results in a jar and a vibration that shortens not only the life of both gears, but also the life of the machine itself.

When Bakelite Micarta-D Gears are put on the job, a gratifying change takes place. Silently and efficiently they enter into their work. When meshed with metal gears the wear on the metal is reduced to a minimum and many dollars are saved on gear replacements. The *super-resiliency* of

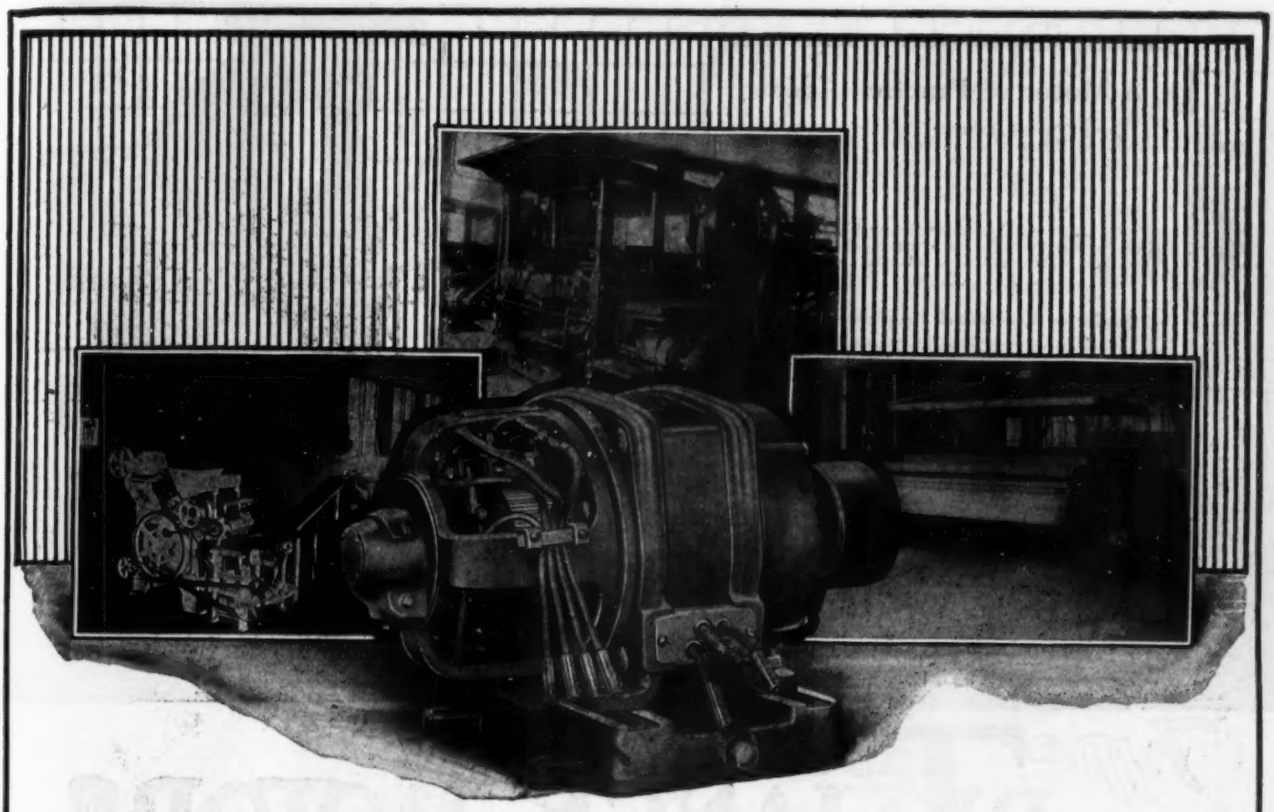
BAKELITE MICARTA-D
Silent Gears and Pinions

makes them superior and preferable to all other non-metallic gears. It is the reason for their unequaled efficiency and endurance. Wherever Bakelite Micarta-D Gears and Pinions are used, gear cooperation is assured.

Westinghouse Electric & Mfg. Co.,
East Pittsburgh, Pa.

W
WESTINGHOUSE ELECTRIC

Westinghouse



RI Single Phase Motors

are particularly well suited to services where reversal of rotation is required—Elevators, Small Cranes, and Hoists—as well as certain machines used in bakeries, laundries and other industries.

Standard 60-cycle non-reversing continuous duty type RI motors can be made reversible at reduced intermittent duty rating by simply bringing out extra leads from the windings to a double-pole, double-throw switch.

The type RI reversing motors are built in sizes from ¼ to 5 hp., 110/220 volts. Shipment on popular sizes and frequencies can be made from stock.

Call up the nearest GENERAL ELECTRIC sales office or
G-E Motor Agency for the size you need.

General Electric Company

General Office: Schenectady, N. Y.

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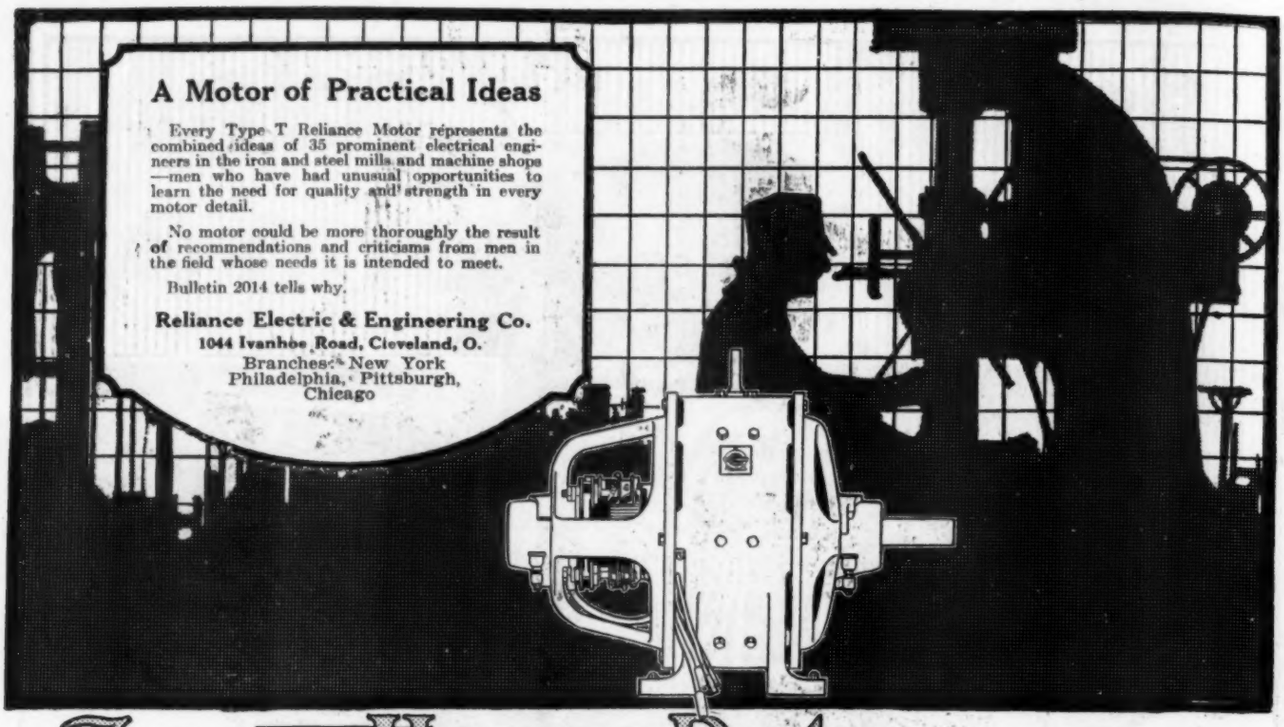
*Southwest General Electric Company. For Canadian Business refer to Canadian General Electric Company, Ltd., Toronto, Ont.
General Foreign Sales Offices, Schenectady, N. Y.; 120 Broadway, New York City; 83 Cannon St., London, E. C., England.

45-5



A Motor of Practical Ideas

Every Type T Reliance Motor represents the combined ideas of 35 prominent electrical engineers in the iron and steel mills and machine shops—men who have had unusual opportunities to learn the need for quality and strength in every motor detail.

No motor could be more thoroughly the result of recommendations and criticisms from men in the field whose needs it is intended to meet.

Bulletin 2014 tells why.

Reliance Electric & Engineering Co.
1044 Ivanhoe Road, Cleveland, O.
Branches: New York
Philadelphia, Pittsburgh,
Chicago

Type T Heavy Duty RELIANCE MOTORS *Direct Current*

A Ransom for 3 Reasons

(1) Gives perfect control with speed variations up to 75-100%.
(2) Automatically provides for overspeeding problem.
(3) Minimizes danger.

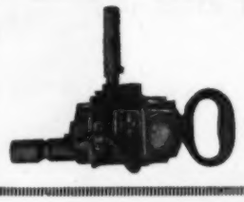
Write

Ransom Mfg. Co., Oshkosh, Wis.

Saving Costly Mistakes

A very small percentage of difference in the composition or hardness of your steel may have serious consequences.
Only the most exact and searching tests can reveal the error, but it is there all the same.
Souther Inspection Service protects you from these and other troubles. Let us outline our service to you.

HENRY SOUTHER ENGINEERING CORP.
Hartford, Conn.



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Take U. S. Electric Tools to the work and save four-fifths of the time usually required on each job. Every kind of portable drill, grinder and buffer ready for prompt delivery. **Write for Catalog.**

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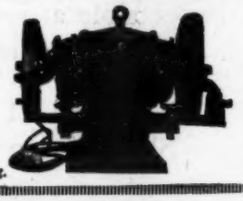
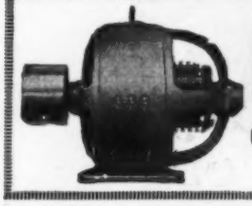
New York Office, 50 Church St. *Boston Office:* 12 Pearl St.
Chicago Office: 549 W. Washington Blvd. *St. Louis Office:* 610 Commercial Bldg.





MOTORS

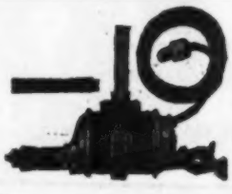
Like the Pyramids, built to last

CROCKER-WHEELER CO.
Ampere, N.J.

INTER-POLE MOTORS

For machine tool work. Constant or adjustable speed. Sparkless operation. Simplicity of control. Rugged and reliable. Write for bulletins.

Electro Dynamic Co., Bayonne, N. J.

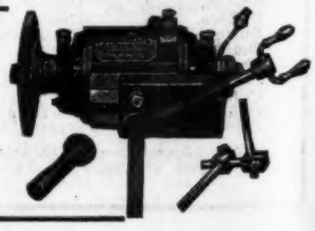


Electric Hand Drills

Made in 12 sizes, ¼ to 2 in. capacities. Hand, Screw Feed, Radials and Bench Drills, Ball and Thrust Bearings.

Tool Post Grinders

¼ to 3 H. P. Weight from 16 pounds up. Free hand feed. Bearings adjustable to wear. Horizontal and vertical feeds. Different types for all purposes. Also Bench and Floor Grinders.



Cincinnati Electrical Tool Co., Cincinnati, Ohio
New York Office, 50 Church Street

Thor *Universal Electric Drills*

Light—Durable—Powerful

Only electric tools equipped throughout with Ball and Roller Bearings. Licensed under Burke Universal Motor Patent.

Independent Pneumatic Tool Co.

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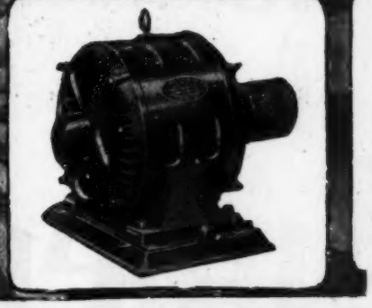
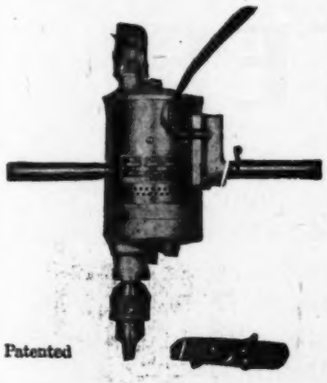
WATSON MOTORS



"Willey"



Patented

means electrically driven. It means correctly built, electrically and mechanically. Further—it means satisfactory service at all times. Every tool is fully guaranteed.

Catalog sent on request.

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For Fast Work

This drill makes possible fast, accurate work with inexperienced workmen.

The Pistol Grip and Trigger Switch gives a firm hold and allows cutting off the current when the bit breaks through without removing either hand from the drill.

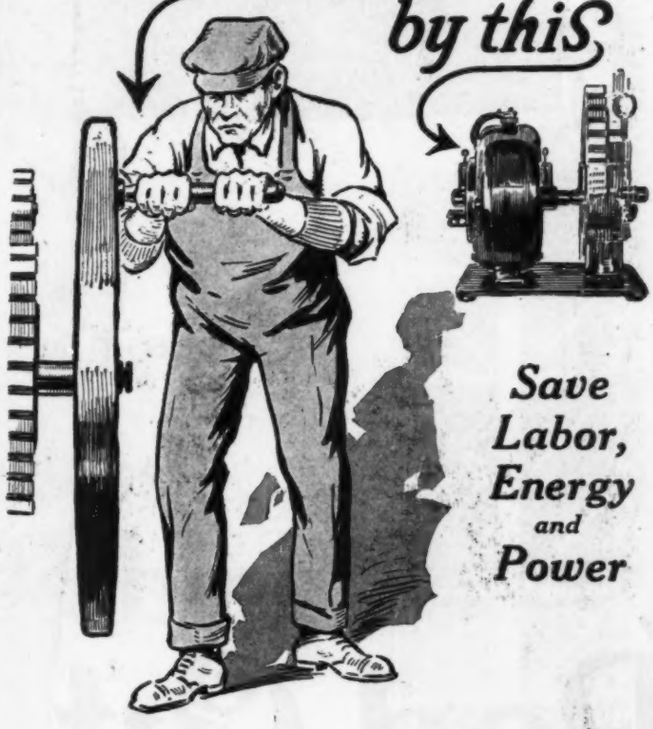
Write for full particulars.

BLACK & DECKER MFG. CO.
661 Liberty St. Baltimore, Md.

B & D Portable Electric Drill

"With the Pistol Grip and Trigger Switch"

Replace this by this



Save Labor, Energy and Power

To build a labor-saving device and have it turned by hand is to defeat your own good intentions. Carry your idea and object clear through by attaching a Holtzer-Cabot Motor of less than one horsepower to operate the machine—saving unnecessary labor. Build the motor into the machine as part and parcel of it. You will find that your machine has a readier market when at the turn of a switch, it operates day in and day out—noiselessly and without any attention whatsoever.

The careful study and the co-operation of Holtzer-Cabot engineers will be gladly given, to help you in adopting the type of motor to run your machine—right.

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M-10

"Red Cut Superior"

HIGH SPEED STEEL

YOU have thought of many qualities you would like to have in High Speed Steel Tools—such as cutting edges with long life, freedom from brittleness, great reserve strength and toughness to resist shocks and strains, tools that would not require special heat treatment, tools that would take deep roughing cuts or fine smooth finishing cuts, and in addition, could be worked at higher speeds than you ever dreamed of. All these virtues and many more are contained in **"Red Cut Superior"**, a First Quality High Speed Steel. Furnished in Annealed Bar Stock, Discs and Treated Tool Holder Bits.

Send for folder.

Are your tools made of **Red Cut** ?

VANADIUM-ALLOYS STEEL CO.

Pittsburgh, Penna. Works at Latrobe, Pa.

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Seamless Steel Tubing

2000 Sizes. 3,000,000 feet on hand at all warehouses.

IN addition to stock of rounds and squares we can supply rectangular or special shapes promptly from the mill. We can also supply high carbon, to harden, or alloyed tubes for special requirements.

Stock Lists Issued Every Two Weeks

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Better Babbitt Satisfaction; and Save More Than Half!

With pleasing regularity, we are proving to skeptics that for general purposes AJAX BULL BABBITT (lead base) will run cooler and wear longer than Genuine or other tin base or lead base babbitts; and, without exception, they are using it.

Instead of Tin Base

If you haven't tried Bull, it's time you learned that you can cut your babbitt bills down two-thirds.

USE
AJAX BULL BABBITT

We recommend it absolutely and will back up every pound we sell with a valid guarantee. Why not try it and see for yourself?

Sample and a copy of the circular, "Ajax Bull Babbitt," on request.

Physically and Chemically the Scientifically Correct Babbitt.

The Ajax Metal Co.

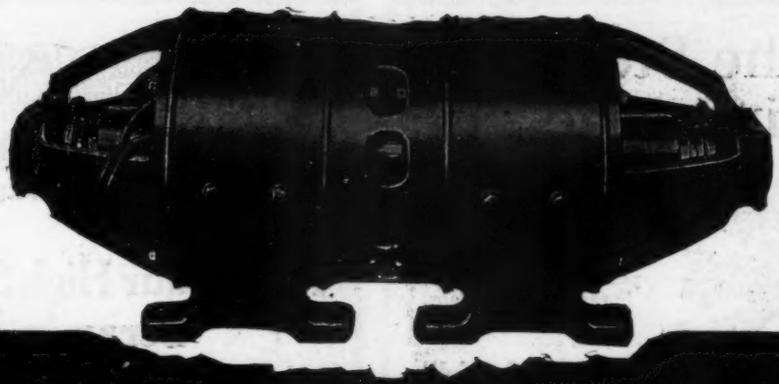
Established 1880
Main Office and Works: Philadelphia, Pa. Southern Plant: Birmingham, Ala.
Offices:
New York Boston St. Louis San Francisco Chicago Washington Pittsburgh

To seek for the finest in forgings is to come to this insignia—eventually.

It denotes "Character" of the kind that can be fully expressed and appreciated only by service. Look for the encircled "S" as well as for the Diamond, if you want service of unfailing character.

The Steel Improvement & Forge Company
5003 Windsor Ave.
Cleveland, O.

Bk.W. 125 volt Balancer Type Arc Welding Set.



Bulletin No. 48940 Describes this Set. Send for it.

Oscillograph curve, showing electrical conditions in welding circuit of constant energy arc welding equipment. Curve "A" shows current in arc approximate average value 150 amps. Curve "B" shows voltage across arc, approximate average value 15½ volts.

Steady flow of metal assured by efficient and simple G. E. Welders

G-E constant energy arc welding sets are used to assure a steady flow of metal into the weld and high operating efficiency.

A constant flow of metal is assured by the inherent automatic regulation of the energy in the welding circuit throughout the welding range for metal electrodes.

The distribution of welding current between the two units comprising the set and practically dispensing with external resistance in series with arc assure high efficiency.

One small panel and the set illustrated are all the equipment needed for a one-man outfit where operator has mask and electrode with flexible cable — if 125 volt direct current is available.

Consistently perfect welds are being produced in essential war industries by the use of this equipment.

We are prepared to demonstrate these sets and make good deliveries.

43-88

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The Steel that gives the cut

Unsurpassed for special endurance, great strength and toughness. For turning, planing and slotting hard materials; for expensive Cutters, Drills, Forming Tools, Taps, Reamers, Punches, Dies, etc.

"Hawk Special" Tool Steel

is particularly suited. Where the speed is not excessive "Hawk Special" will take the place of High-Speed Steel to good advantage.

We can supply steel of almost any size and shape, and for any purpose. Write today for our latest stock list. You will probably find in it just the steel you need. Prompt shipments made from our large stock.

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HIGH ON SPEED
TRADE MARK

Keep Your High Speed Steel Scrap in Use
HOW?

By having it converted into
ON High Speed Steel

Every Bar Guaranteed

Write for Catalog.

ONONDAGA STEEL COMPANY
-INCORPORATED-
SYRACUSE, NEW YORK

Increase Production

By use of the time and money saving

Jessop's Annealed Die-Blocks

Made of superior tool steel in rings and forgings of irregular shapes—we can supply them quick. Annealed cutter blanks, too.

Send along your inquiries.

Wm. Jessop & Sons, Inc.
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163 High St., Boston, Mass.

Another discovery not made by Germany—that Uranium introduced into high-speed steel increases the toughness and durability of this metal. Uranium Electrite is a Super Steel. We can send you valuable information.

Latrobe Electric Steel Co., Latrobe Pa.

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FIRTH-STERLING TOOL STEELS

THE knowledge, experience and skill of SHEFFIELD combined with the best PITTSBURGH practice have made these steels the standards of QUALITY and UNIFORMITY wherever Tools are used

FIRTH-STERLING STEEL COMPANY

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MILLS AND GENERAL OFFICES PITTSBURGH, PA.

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MANUFACTURERS OF
COLD DRAWN AND DIE ROLLED ROUNDS, HEXAGONS, SQUARES, FLATS, SPECIAL SHAPES, SCREW STOCK, AXLE AND ALLOY STEELS, "COLUMBIA"
TURNED AND POLISHED STEEL SHAFTING
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Angles, Tees, Cutter Bars, Knife Backs, Bevel Edge and Cam Sections
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We are prepared to furnish, in the shortest possible time consistent with perfection in quality, a great many special shapes in accordance with specifications furnished. The accompanying illustrations will convey some idea of the irregular shapes we have made. The illustrations are intended only to show possibilities in the line of cold-drawn steel bar special shapes for manufacturing purposes.

Inquiries should be accompanied by drawing or sample section (the latter preferred), together with advices as to grade of material required, or the purpose for which it is to be used, and quantity involved.

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The first Peace shots of our Merchant Marine

"We are only now beginning our programe of ship construction," says Chairman Hurley.

Work must go on—quickly, smoothly, economically.

In the ship yards and in the machine shops, wherever there is metal to be cut—you can do it quickly, smoothly, economically with Colonial High Speed Steel.

The fast cutting power of "Colonial" will aid you in the first Peace shots of your business.

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Alternating Current Electric Arc Portable Guaranteed Machines

We have machines for all kinds of work, and can show economy over other systems. *Recommended for the following work:*

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(Especially tanks requiring absolute tightness)

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(Especially the introduction of odd-shaped tees and branches)

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Cutting of shell stock by nicking, and kindred uses.

Welding Wire (Bare and Covered) in stock at all times

Prompt Deliveries

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CONSISTENTLY UNIFORM

LUDLUM

ESTABLISHED 1854

Pompton	Carbon Tool Steel
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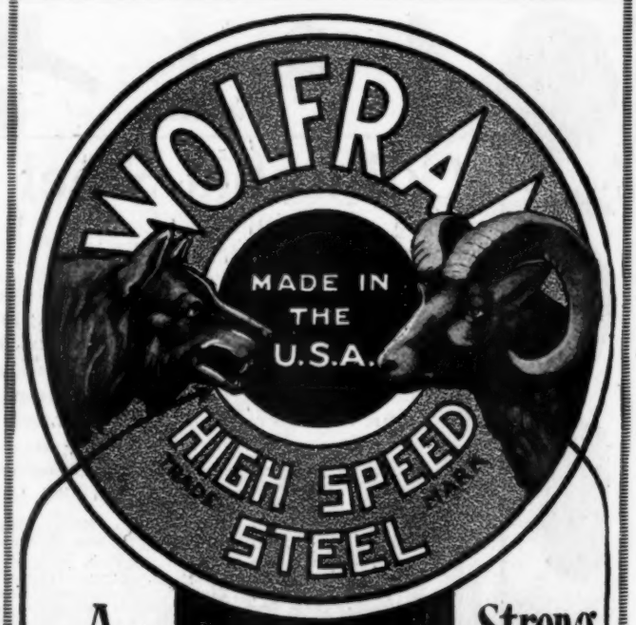

A Keen Cutter

WOLFRAM *Is Both*

VULCAN CRUCIBLE STEEL CO.
Aliquippa Pa: U.S.A.
Represented in Canada by Messrs Norton Callard & Company Que.

Strong in the Neck

Magic
SOLUBLE OIL

Mixes perfectly with water in any proportion without the use of an alkali. It is safe and clean. Remarkable records have been made on turning, milling, drilling, threading and stock cutting. Barrel on approval.

Fiske Bros. Refining Co.
24 State St., New York City
Agents in large cities. Factories: Newark, N. J., Toledo, O.

New oil from old oil ——— New waste from waste waste

no more than a trace of oil remains in oily-chips after passing through this machine. Same is true of waste. The reclamation in both cases is the limit of mechanical possibilities. ¶ Centrifugal; direct steam turbine drive. Quadruple capacity of belt driven machines. Quicker, better; more easily charged and discharged; less driving power; longer life. Every possible feature for ease in handling. Write for full data.

Savoil Separators

Oil & Waste Saving Mach. Co., Real Estate Trust Bldg., Phila., Pa.

ARMCO IRON Welding Rods

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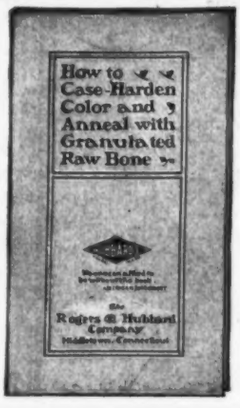

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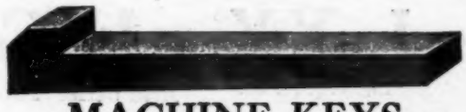

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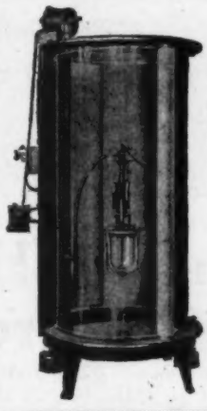

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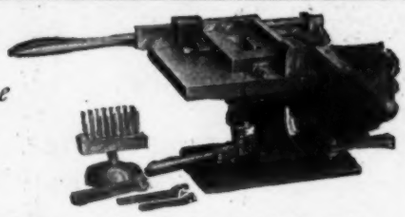

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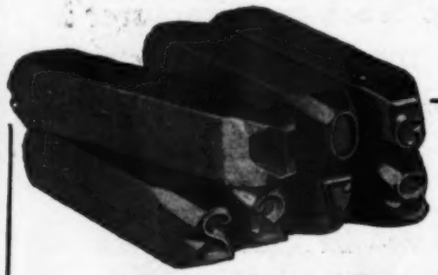

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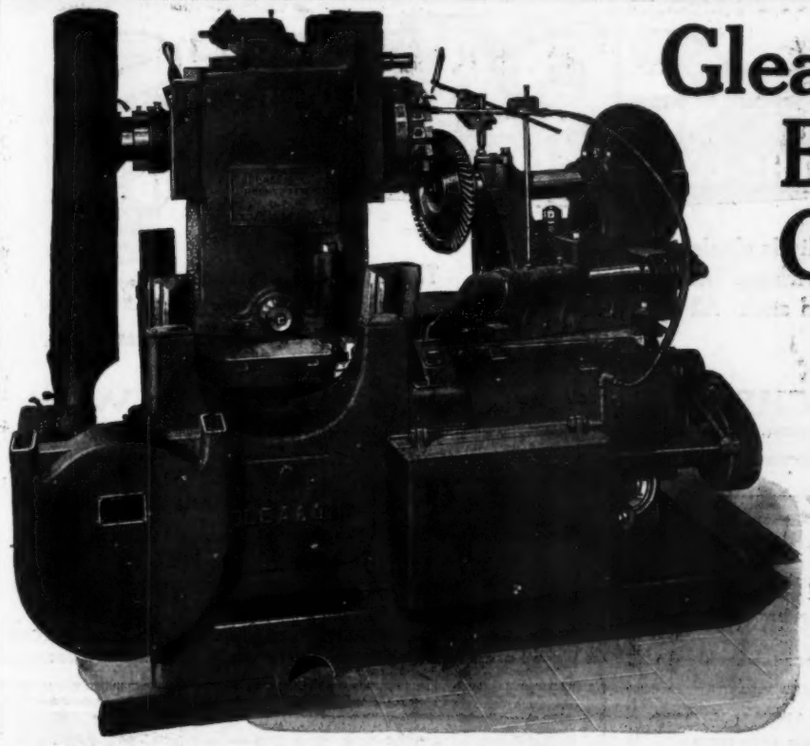

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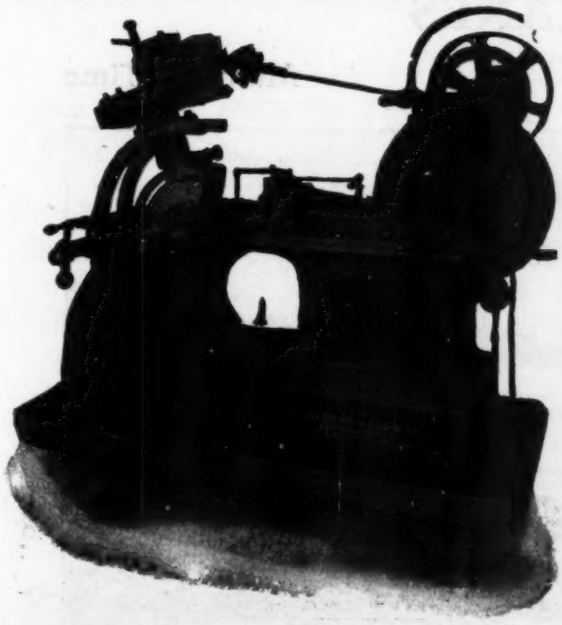

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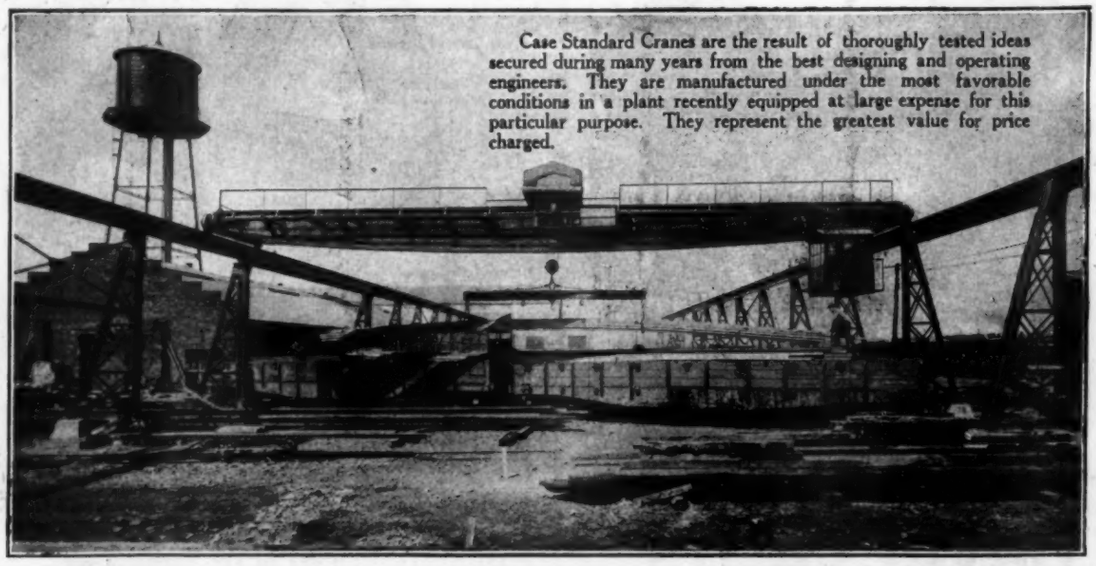

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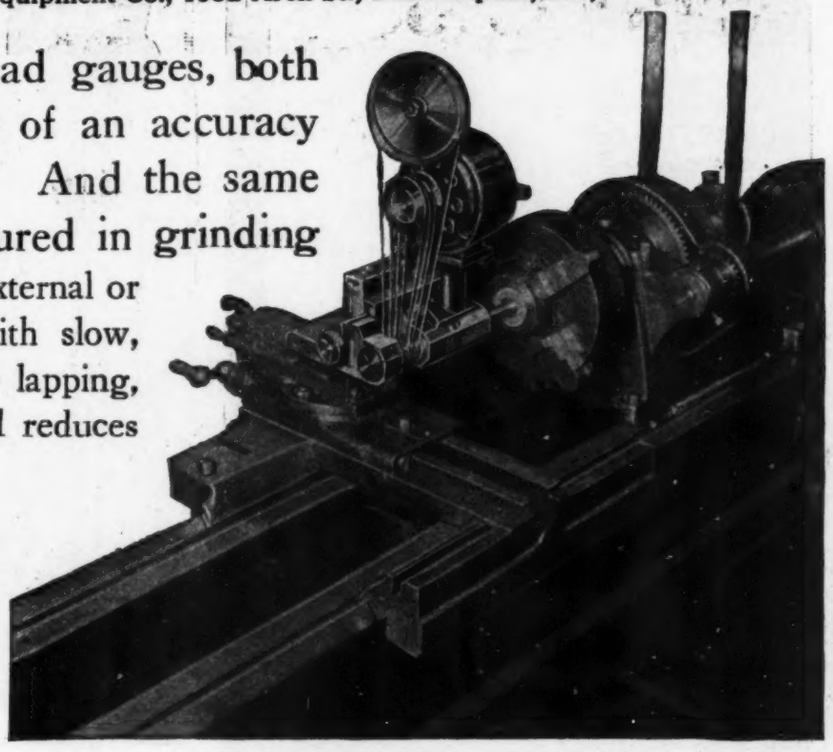

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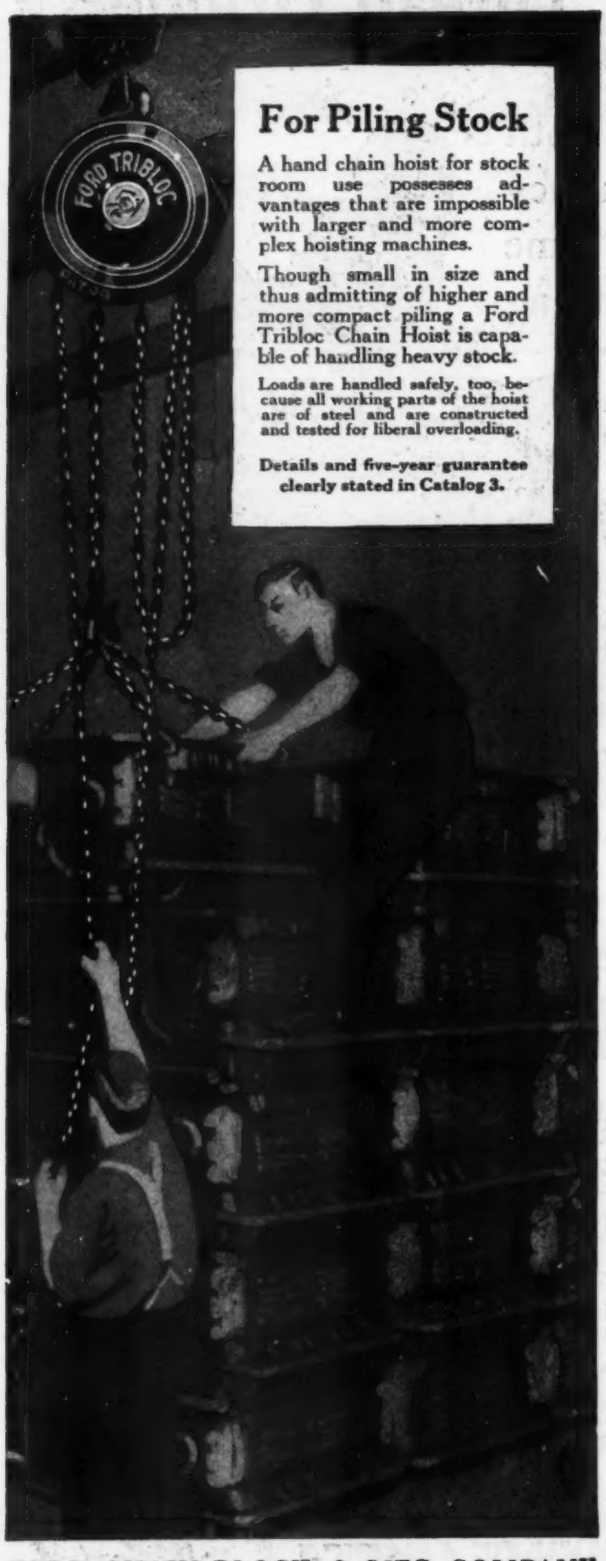

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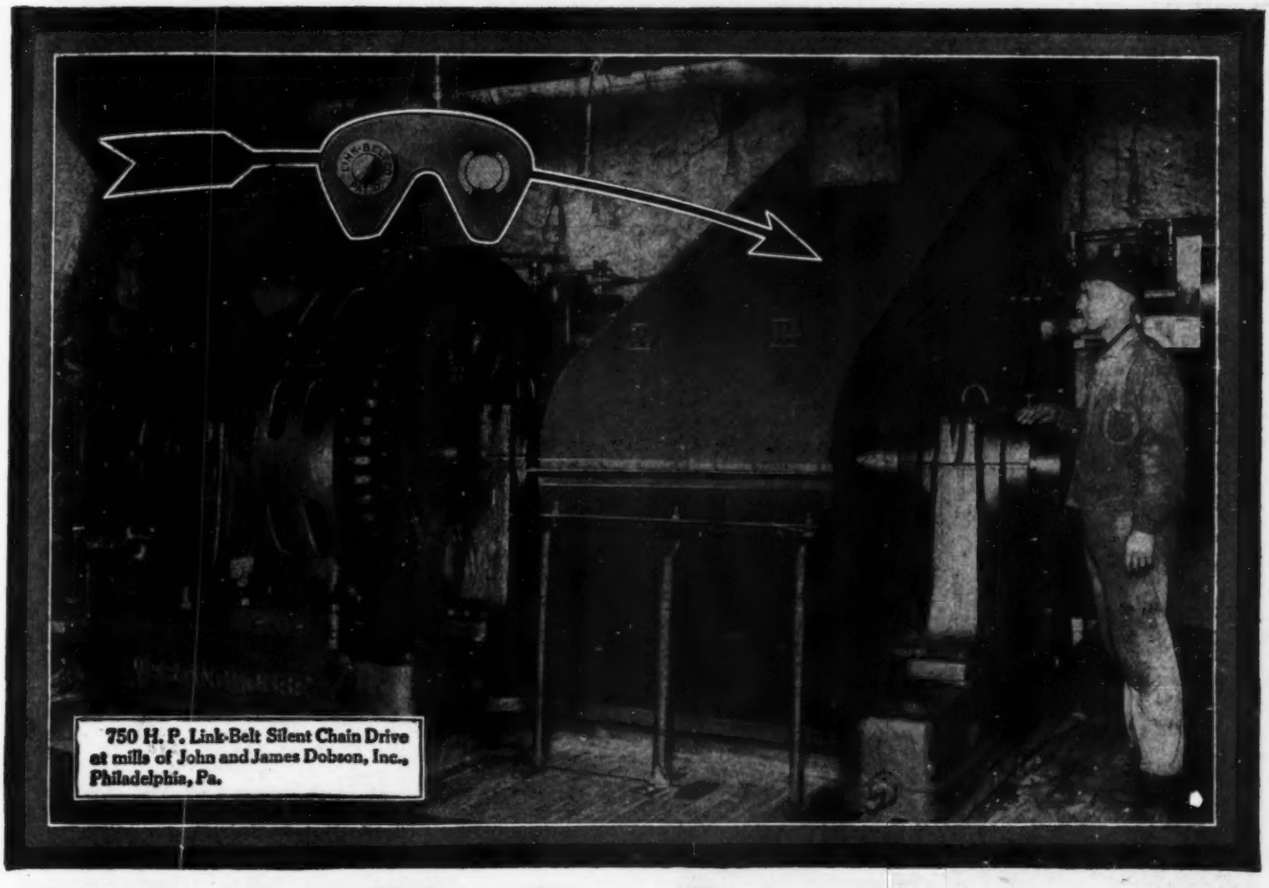

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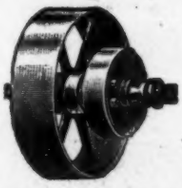

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The per hour cost on Gilmer Belts is less than any belt made.
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L. H. GILMER COMPANY

7100 Keystone St. Tacony, Phila., Pa.

Practically Wear Proof

Gray and Prior Universal Joints have all wearing surfaces thoroughly case-hardened and the parts are fitted to such nicety that there is positively no play or looseness in any direction. **Write for Descriptive Circular.**

The Gray & Prior Machine Co.

69 Suffield St. Hartford, Conn., U. S. A.

We Can Supply it in a Rush

If it's a chain, whether it be large or small, roller or block we have it for you.

Our Catalog No. 18 is worth keeping on file—send for it.

The Baldwin Chain & Mfg. Co.

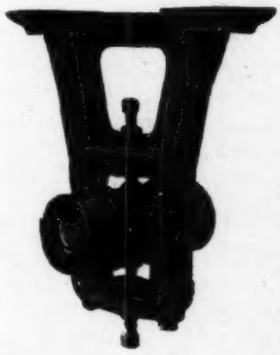
Worcester, Mass.

J. M. Howe, 245 Plymouth Bldg., Minneapolis, Minn.

BOND

Universal Drop Hangers

Ring Oiling



Heavy and substantial — affords ample strength for supporting shaft, and yet imposes no unnecessary weight on ceiling.

The universal adjustment — both vertical and horizontal — enables any misalignment in the line shaft to be quickly corrected.

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Bond

Foundry and Machine Co.

Sole Manufacturers

Manheim, Lancaster Co., Pa.

TRADE MARK B D-S REG. U.S. PAT. OFF. BOND DOUBLE-SURE QUALITY

WHITING CRANES

Cut shows type "E" Service Jib Cranes fitted with chain blocks and air hoists in Big Four shops, Indianapolis, Ind. Just the thing for serving planers and machine tools.

Any Span or Capacity

Send for Catalog 130

Complete Foundry Equipment

WHITING
FOUNDRY EQUIPMENT CO
HARVEY-ILL. U.S.A.
CHICAGO SUBURB

Cranes of all Kinds

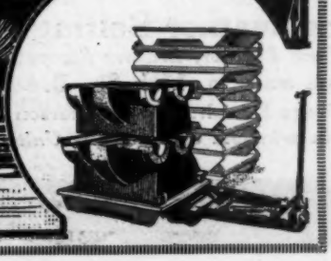
StueRing

LIFT TRUCKS

Unless

you are using Stuebing Lift Trucks for inside factory haulage, you are not getting maximum efficiency. There are many reasons why the Stuebing is more economical. It will pay you to know more about their service. Stuebing is the choice of such large concerns as Allis-Chalmers, Westinghouse Electric, Lincoln Motors, International Harvester Company, Lyons-Atlas and many others. Send for free book "System in Trucking." It will help solve your trucking problems.

The Stuebing Truck Co.
42 Fosdick Bldg.
Cincinnati, Ohio



GRATON & KNIGHT

Standardized Series

LEATHER BELTING

Tanned by us for belting use

GRATON AND KNIGHT

When the Belt Works Right

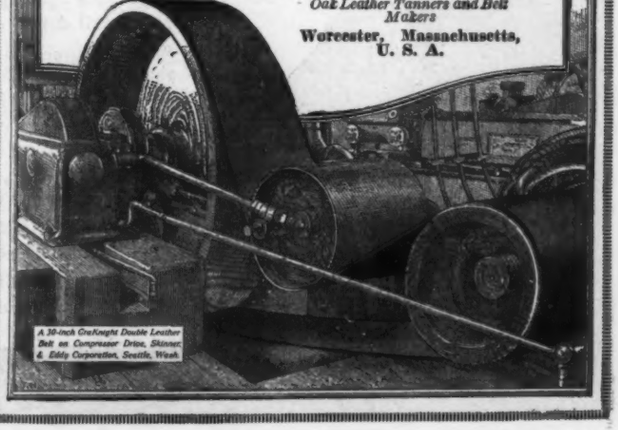
One ounce of performance is worth a ton of *speculation* as to horsepower delivery. The best answer in belt performance is when the belt works *right*—with the utmost of uninterrupted driving energy; with economy written into every fuel bill.

Write for a copy of our booklet, "Standardized Leather Belting," explaining scientifically the application of standardization to belting.

THE GRATON & KNIGHT MFG. CO.

Oak Leather Tanners and Belt Makers

Worcester, Massachusetts, U. S. A.



A 30-inch GraKnight Double Leather Belt on Compressor Drive, Skinner & Eddy Corporation, Seattle, Wash.

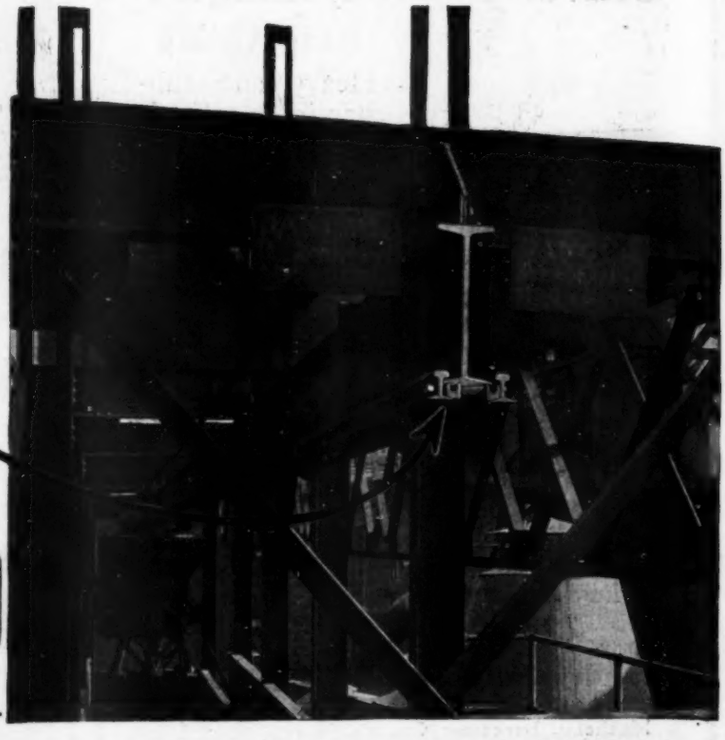
The Experience of Leading Plants

Has proved the superior efficiency of the steel T-rail as compared with structural iron I-beam flanges for supporting the heavy rolling burden of hoist or crane.

Shepard Track

Is simple in installation—efficient in operation. It provides a hard surface and tough cross section—and long years of wear without replacement. It eliminates all wear on the I-beam itself.

Let us give you further details.



SHEPARD
ELECTRIC CRANE & HOIST CO.
New-York Philadelphia **Montour Falls, N.Y.** Chicago Pittsburgh
Boston, Baltimore, Birmingham, San-Francisco, Montreal, Melbourne, London.

"IT MEANS money because it saves me money. Not sometimes—*but all the time.* I used to order belting here and there, buying sometimes on prices and sometimes on a salesman's word.

"*Now* I know better. There are no drives in my plant belted by leather which does not bear the trademark of the New York Belting Company. The reason? Merely a matter of common 'cents.' Their Phoenix Regular and Wetite waterproof brands are built to transmit power without leakage or wasting. They grip instead of slip on the pulleys. They run straight and true and never fall down on the job. They are dependable belts.

"In these times, reliability is worth a lot. Long experience has proved to me that the economical way to buy belting is to say: 'Look for the trademark of the New York Leather Belting Company.'"

When you buy belting look for THIS trademark. It is a merit-mark on leather belting. Order by it.

New York Leather Belting Company
Leather Belting, Lace Leather, Leather Strapping and Specialties
Kent Avenue and So. 11th St., Brooklyn, N. Y.
Chicago Branch: 32 So. Jefferson St.
Dealers in principal cities of the United States

TOLEDO CRANES
125-TON LADLE CRANE
TRAVELING CRANES — STEEL STRUCTURES
FEBRUARY 1919
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16 17 18 19 20 21 22
23 24 25 26 27 28
JANUARY 1919
SUN MON TUE WED THU FRI SAT
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MARCH 1919
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THE TOLEDO BRIDGE & CRANE CO.
TOLEDO OHIO

We Offer You Our New 1919 Calendar

We offer you our new 1919 calendar. It is a large size, 14x20 inches over all — two colors, black and blue. The three months appear on each leaf, which tends to make it most convenient. We know you'll want one and we will be happy to send it upon the receipt of this page mailed to us. Please fill in your address here:

The Toledo Bridge & Crane Co.
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The World's Master Ball Bearing for Line Shafting

It can be truly said of Chapmans for their universal success in nearly 4000 plants and over 16 years of giving complete satisfaction justly award them this title.

May we send you a record of their performance and Catalog No. 3-D?

THE TRANSMISSION BALL BEARING CO.
1050 Military Road, Buffalo, N. Y.
NEW YORK — CHICAGO — CLEVELAND
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One of the many types of frames they fit.

Save Your Hanger Frames. We've a Bearing That Will Fit Them.

Quality Superb

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Schatz "Universal"
Annular Ball Bearing
The Super Bearing

IT is a self-contained annular ball bearing that will sustain successfully from 300% to 400% more end thrust than any other known annular bearing. The Schatz "Universal" takes end thrust

In either direction.
Without adjustment of any kind.
Without the slightest impairment of annular efficiency.

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The Federal Bearings Co., Inc.
44 William Street, Poughkeepsie, N. Y.
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Established 1907

P-L TRADE MARK **Phosphor Lignum** P-L TRADE MARK
Self Lubricating Bearings

have been in constant use by many of the largest Machinery Manufacturers for the past ten years. Our treatments permit different melting periods for different speeds.

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N. B.: Give speed of shaft when you order.

Ball Thrust Bearings

of all types used in airplane construction.

Thrust Bearings

built to your requirements.

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Lancaster, Penna.

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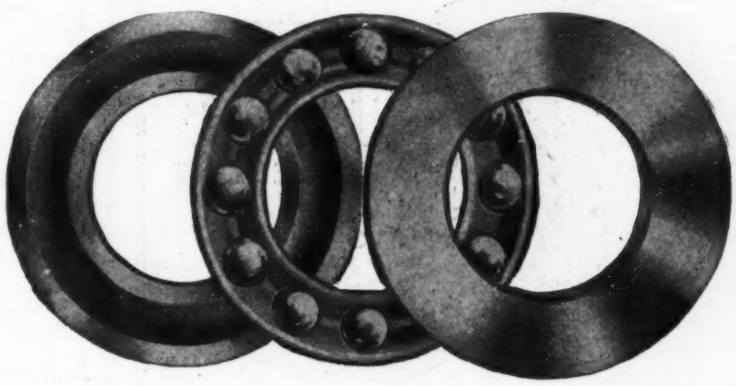
1012 Ford Bldg., Detroit, Mich.



Ask your dealer for prices.

Pointing to the Reason of a Permanent Tight Connection

Bronze to Bronze

The Dart Union has two bronze seats in the vital part, perfectly ground, that will not corrode. Requires no packing. *May we send you a free sample and our Illustrated Catalog?*

E. M. DART M'F'G CO., Providence, R. I.
The Fairbanks Co., Sales Agents.
Canadian Factory, Dart Union Co., Ltd., Toronto

Elevator Economy

Caldwell Elevators are designed to effect considerable saving in the handling of materials of various kinds.

They are built in many types and sizes. Our engineers will designate the type that will best serve you. Ask them.

H. W. Caldwell & Son Co.
Chicago—17th St. and Western Ave.
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BALL AND ROLLER BEARINGS

All Types IN STOCK Many Size
THE GWILLIAM COMPANY
Engineers
253 W. 58th St. (at Broadway),
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Arguto NON-METALLIC **Oilless Bearings**

for loose pulleys, friction clutches, high speed machinery. Eliminates lubrication—runs from 8 to 15 years without oiling.

ARGUTO OILLESS BEARING CO.
147 Berkley Street Philadelphia

Drives Machine At Any Desired Speed From 1 to 6

There's no simpler way of obtaining variable speed than by using the Evans Variable Speed Countershaft. And no *surer* way. All you have to do to change the speed is pull the cord. You can change the speed while the machine is running and what's more you can stop *and start* again at any desired speed. We guarantee the service that this device will give. The fact that over 10,000 sets are in use is in itself a guarantee of satisfaction. Made for floor or hanging use.

Catalog 25?

Evans Friction Cone Co.
Newton Highlands, Mass.
A. Warden & Co., 48 Shepherdess Walk, City Road, London, E. C., England

STEEL BALLS

If that is what you want we can furnish you. All we ask is an opportunity to quote on your requirements—**any grade**—and after one trial you will specify nothing but "**Abbott**" make.

Kindly give us an opportunity to quote you our attractive prices.

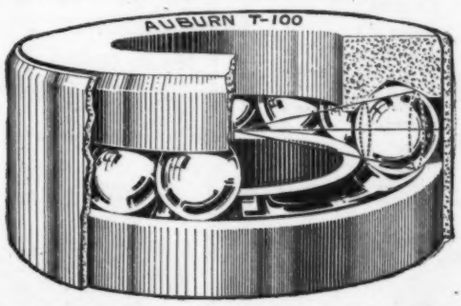
Abbott Ball Co., P. O. Box 1233 **Hartford, Conn.**

YOUR THRUST PROBLEMS ANSWERED

AUBURN

Trade Mark

STEEL, BRASS and BRONZE BALLS



AUBURN

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BALL THRUST BEARINGS

Put Your Problems Up to Us, or Ask for Bulletins

AUBURN BALL BEARING CO., 25 Elizabeth St., Rochester, N. Y.

LADEW
TURTLE
LEATHER BELTING
Waterproof
Oilproof
Timeproof
EDW. R. LADEW CO., INC.
GLEN COVE, NEW YORK, U.S.A.

Lap? No—Seam? No—Splice? No—

Think of the advantage of such a belt on light drive high speed machinery. No lap vibration to impair accuracy, no stretch to impair driving power.

TILTON

Patented Endless Belt

offers maximum results in efficiency—can you afford to pass up an opportunity to prove this to your own satisfaction? We'll send a sample belt free.

ARTHUR S. BROWN MFG. CO., Tilton, N. H.

ROCKWOOD
Friction Transmission

In all machinery where quick starts and sudden stops are necessary, ROCKWOOD Friction Transmission is unequaled. It provides the five vital factors essential in power transmission; extreme simplicity—unlimited speed range—perfect quiet—lower first cost—minimum upkeep.
It is far superior to toothed gears.

An Invaluable Book—

Every manufacturer and engineer should have "Friction Transmission." Brimful of valuable data and formulae. Free. Please mention firm connections.

The Rockwood Mfg. Co. 1910 English Avenue Indianapolis, Ind.

AMERICAN
STEEL SPLIT
PULLEYS

Tests, under working conditions, have proven that "American" Pulleys transmit maximum power with minimum waste. They reduce belt slip and air resistance to a minimum. Guaranteed for double belt duty. Speeds up to 6000 feet per minute are recommended.

Write for 37-page book "Getting Maximum Pulley Efficiency."

The American Pulley Company
Philadelphia, Pa.

Mule Pull Clutches

take the smile off the repair man's face. He's looking for another job now.

Brown Engineering Co.
115 North Third St., Reading, Pa.

PINTITE
RIGID COUPLINGS
PINTITE

Smith-Serrell Co., Inc., 87 West St., New York

No matter what the product, the principle always remains the same. If you have indoor trucking to do, do it with

THE COWAN TRANSVEYOR
TRADE MARK REG U.S. PAT OFFICE

It it isn't a Cowan, it isn't a Transveyor.

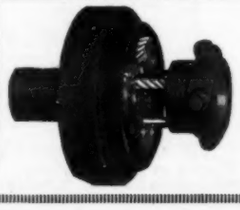
Write for our catalogue
COWAN TRUCK COMPANY
16 Water St., Holyoke, Mass.

SELF OILING UNIVERSAL JOINTS

Once oiled, our Universal Joints do not need attention for a year. Made of the finest material—used by many of the large users of Universal Joints.

Write today for Catalog and price list.

Mutual Machine Company
27 Wells Street, Hartford, Conn.



CLUTCHES for all purposes

Quick shipments from large finished stock.

Hilliard Clutch & Mchy. Co.
Elmira, N. Y.

SCIENTIFIC MANAGEMENT

What Is It?

Simply the adoption of those principles that make for increased production and economy. And hereafter it will be practiced on a more intensive scale than ever before.

The war is ended so far as a continuation of the bloody combats of the battlefields is concerned. But in the war after the war there will be waged lively battles for industrial supremacy wherein the advantage will lie with the plant equipped with the most modern, durable and economical time and labor saving machinery.

Many manufacturing plants that are still working on Government orders will soon face a resumption of normal conditions. Competition will be more intense. What inducements can YOU offer that will bring business, more business, big business. Price and quality and quick delivery are going to be the deciding factors. And in this connection keep your eye on the overhead. It has been looming large these past few years and must certainly come down.

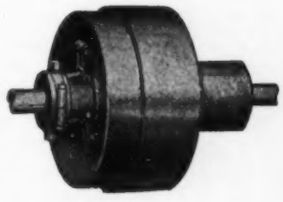
MOORE & WHITE FRICTION CLUTCHES WILL HELP YOU

ring down the curtain on the high cost of production. They enable you to shut down any department not needed when your plant is running overtime. They save belt expense. Should a man get caught in machine or shafting, one switch of the Clutch Lever may save his life and you perhaps a lawsuit.

When in the Market for Friction Clutches Figure Your Friction Clutch Installation with This Book

Sent Free Upon Request
Write Today for a Copy

Ask for Catalog "E"



Contains Complete Information Regarding Friction Clutches for All Kinds of Work.

Weights, Bores, Dimensions, Speeds, Horsepowers, etc.

We make Standard Clutches for low speed and moderate horsepower. High Speed Clutches for high speed and great horsepower.

If you have any use at all for Friction Clutches you cannot afford to be without this Catalog.

"M. & W." Friction Clutches Eliminate Transmission Troubles.

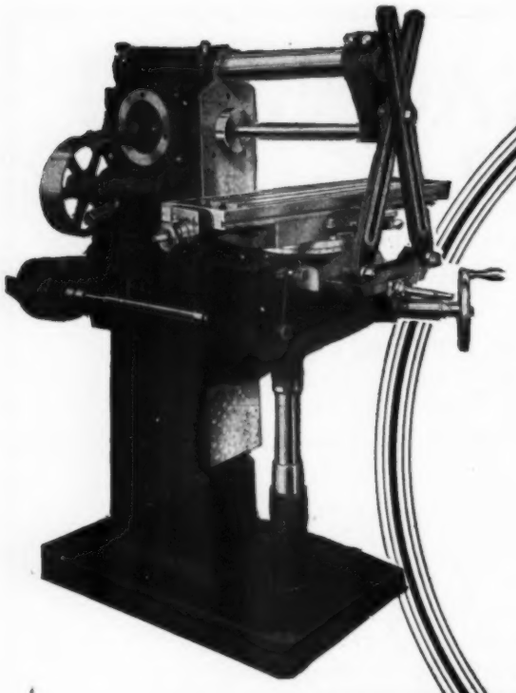
MADE ONLY BY

THE MOORE & WHITE COMPANY

2701 to 2731 North 15th Street, PHILADELPHIA, PA., U. S. A.

Builders of Clutches for 32 Years.

Sold by leading dealers in Mine, Mill and Factory Supplies



Machine illustrated is our 2-A Universal Miller. It is Furnished complete with 10-in. Universal Dividing Head, Spiral Cutting Attachment and 6-in. Chuck.

Hardened gears throughout insure long life.

This type machine is built either plain or universal.

We build cone pulley type Millers, Dividing Heads and Milling Machine Vises.

Our manufacturing facilities enable us to make attractive delivery dates.

Write for full information

FOX MACHINE CO., Jackson, Mich.

1803 W. Ganson Street
Formerly of Grand Rapids, Mich.

FOX Universal Milling Machine

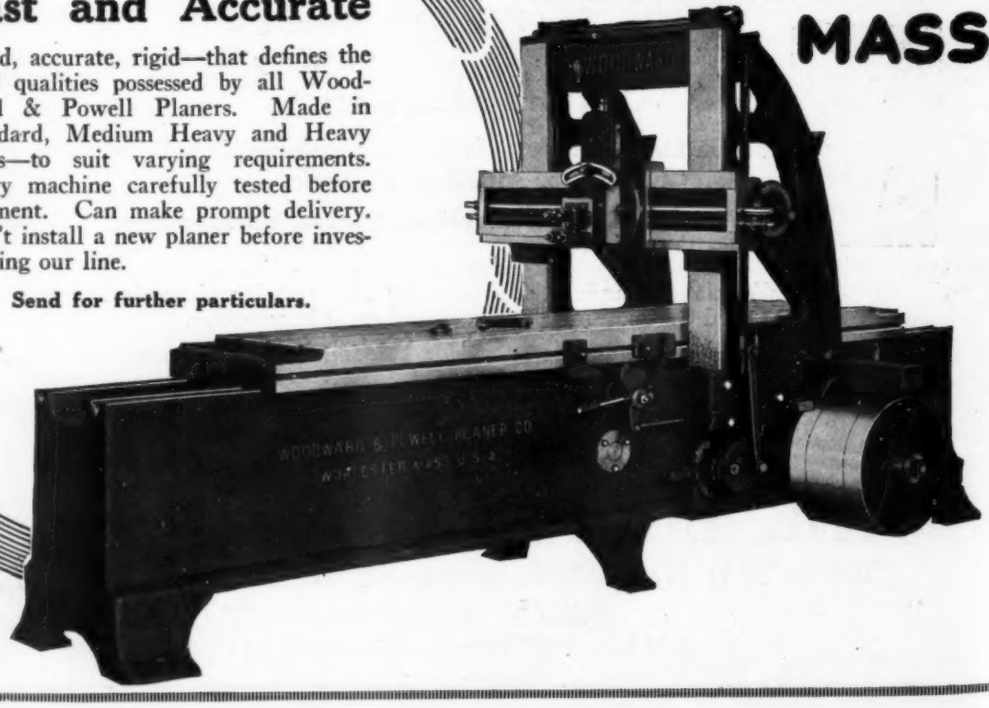
WOODWARD & POWELL PLANER CO.

WORCESTER MASS.

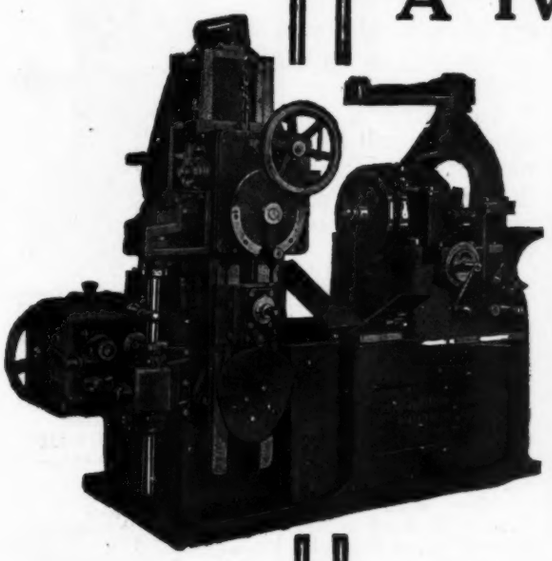
Fast and Accurate

Rapid, accurate, rigid—that defines the chief qualities possessed by all Woodward & Powell Planers. Made in Standard, Medium Heavy and Heavy styles—to suit varying requirements. Every machine carefully tested before shipment. Can make prompt delivery. Don't install a new planer before investigating our line.

Send for further particulars.



A Two-in-One Machine



It really is—because work that formerly required two types of machines, or special fixtures, can be executed entirely on it with the greatest ease. It cuts all styles of cams up to 28-in. diameter and cuts them quicker and more accurately than any other machine.

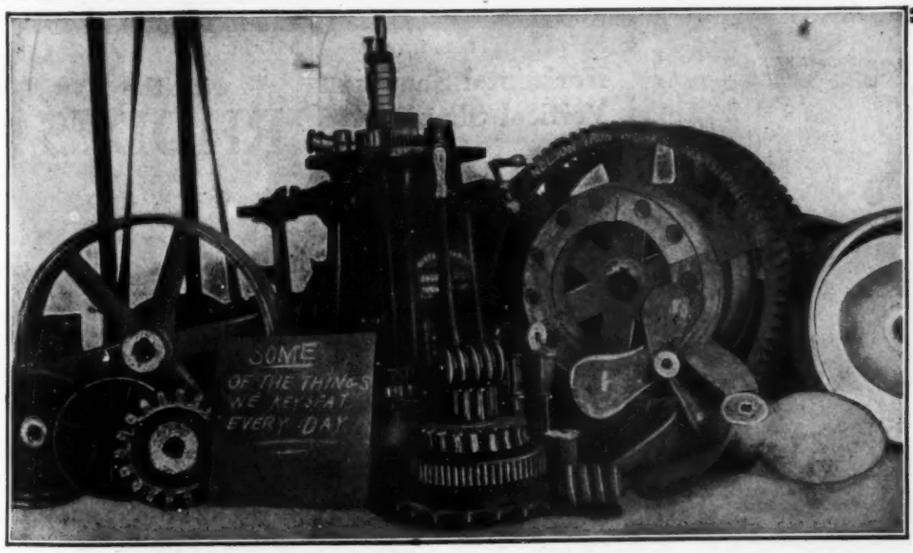
Rowbottom Cam Milling Machine

If you are anxious to turn out a more perfect product, as well as cut labor costs, it will pay you to investigate this machine.

Write for Bulletin 102

Remember—
"Rowbottom for Cams"

The Rowbottom Machine Company
Waterbury, Connecticut, U. S. A.
Factory at Waterville, Conn.



3 Steel Spiral Gears 1 in. bore, ¼ in. key, cut all together.
Bronze Spirals to fit 1⅝ in. bore, ¼ in. key.
30 in. Friction Pulley 2½ in. bore, hub 10 in. long, ⅝ in. taper key.
36 in. Bull Wheel, 3⅞ in. bore, 1 in. taper key.
3 Bronze Propellers with taper bore, key parallel with taper

A Few Minutes' Work on the "GIANT" Keyseater

"The Proof of the Pudding"

The best proof that a machine can do the work claimed for it is in work that it has done.

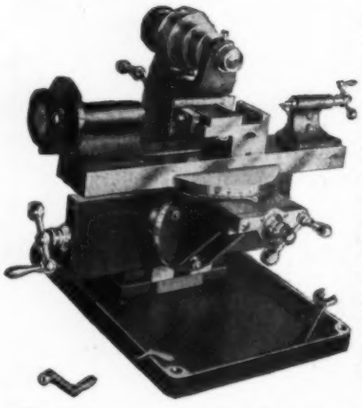
The illustration gives a few examples of keyseating such as the Giant produces in good shops all over the country *every day*.

Its accuracy has never been questioned, for the tool has a perfectly solid support through entire stroke—so simple and fast that job is finished in the time it takes to mount the work on most other machines. Get our Catalog—it tells.

Mitts & Merrill, 913 Tilden St., Saginaw, Mich.

Foreign Agents: Burton, Griffiths & Co., London, Eng., and Aux Forges Des Vulcain, Lyons and Paris, France.

S & C Bench Milling Machine



For small gauge work and such work as small milling cutters, reamers, etc., this machine is superior to large floor-type machines both for output and accuracy. Also good manufacturing proposition for small parts like fuse parts, parts for detonators, etc.

Will meet your requirements to a nicety—you can't buy more milling efficiency than is embodied in the design and construction of this machine.

The special feature of this machine is that table can be moved to any angle horizontally and vertically

Write for catalog today.

Sloan & Chace Mfg. Co., Ltd.

6th Ave. and No. 13th St. Newark, N. J.

Manufacturers of Precision Machinery, Bench Lathes, Drill Presses, Milling Machines, Gear and Pinion Cutters, Tools, Fixtures and Gauges.

Small Parts

can be machined most economically on small machines.

A large lathe is not adapted to small lathe work.

A large planer is not adapted to small planer work. Use a

Steptoe Shaper

A large milling machine is not adapted to small milling machine work.

The small machine can be handled much more quickly, thereby increasing production.

Put your small milling machine work on a STEPTOE hand miller or small power feed miller (with or without backgears) and you will have more time to do large work on the large machines.

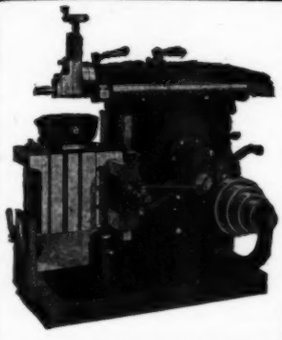
Steptoe Millers

are especially adapted to the manufacturing of small parts rapidly.

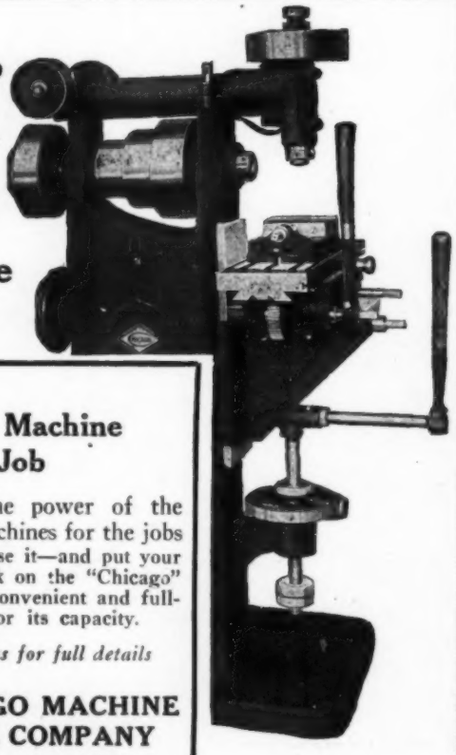
JOHN STEPTOE COMPANY

Manufacturers of Shapers and Milling Machines

NORTHSIDE CINCINNATI, OHIO



Chicago Small Milling Machine



Fit the Machine To the Job

—save the power of the larger machines for the jobs that can use it—and put your small work on the "Chicago"—sturdy, convenient and full-powered for its capacity.

Write us for full details

CHICAGO MACHINE TOOL COMPANY

647 Washington Blvd.

Chicago, Ill., U. S. A.

Horizontal Shaping
Vertical Shaping

with the

RHODES

One machine — the Rhodes—enables both operations. And it does the work of heavier machines, too, with less power. From a horizontal shaper with 7 in. stroke to 3½ in. vertical slotter adjustable to 10 deg. is a simple change. The details will interest you.

The Rhodes Mfg. Co.

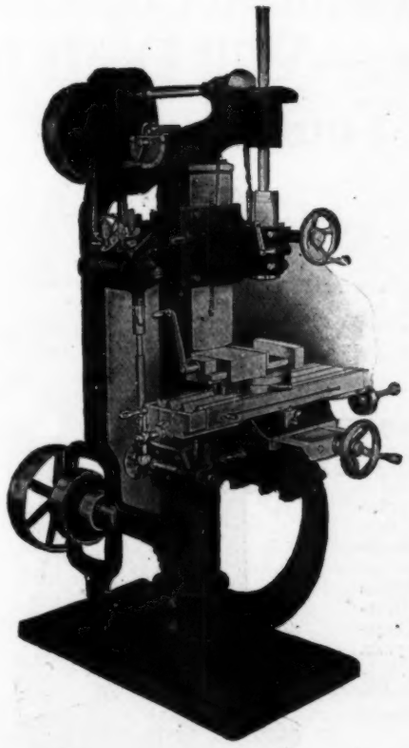
Hartford Conn.

Efficiency

in the

Tool Room

MILLING 45º VARIATION K 2 MACHINES IN ONE DRILLING



The Knight Drilling and Milling Machine

The Knight Drilling and Milling Machine is a big factor in introducing efficiency in your tool room for the big reason that it does the work of two machines and does many operations better, quicker, consequently cheaper.

Knight Vertical Spindle Milling Machines are constantly coming into more general use owing to the saving of time in chucking the work and the fact that the operator can at all times see just what he is doing. This is especially advantageous when on small particular work such as dies, jigs, tools, etc. The tilting table allows the drilling and milling of a tool at different angles without rechucking; you can readily see the great saving effected.

MANUFACTURING—

For the rapid production of duplicate parts the Knight Milling and Drilling Machine used as a miller is unsurpassable for speed and adaptability.

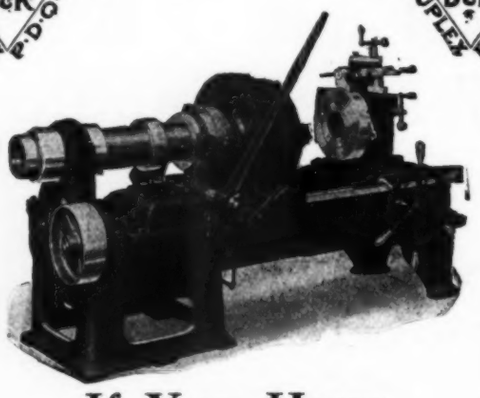
Space is too limited here to enumerate the many feats the Knight will perform, but complete details will be promptly furnished on request; send yours today.

W. B. Knight Machinery Company

St. Louis, Missouri

Foreign Agents: Coats Mch. Tool Co., Ltd., London, Glasgow and Newcastle-on-Tyne.

PEERLESS B&K DUPLEX P·D·Q·C



If You Have Pipe Threading

You should send for our catalog of Improved Machines. It shows a complete line of machines from ¼-in. to 18-in., both belt and motor drive. All machines are equipped with the Peerless Die Head.

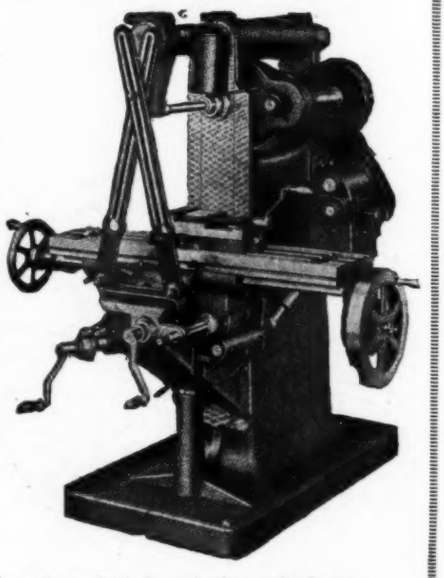
Write for Bulletins.

BIGNALL & KEELER MACHINE WORKS
Edwardsville, Ill.

Put Speed Into 1919 with the Dow

Here's the machine for the coming year—the machine that does good work quickly. A positive Feed Silent Chain Drive with 12 changes gives big production. Accuracy assured by Heavy Construction and High - Grade Workmanship.

Write for Description and Prices.

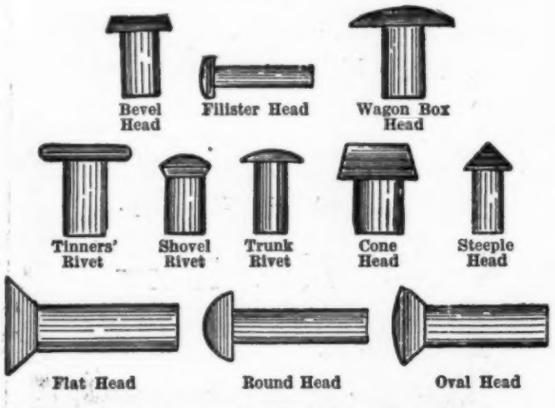


Our circular gives full description which you should have.

Dow Manufacturing Co.
Braintree, Mass., U. S. A.

Screw-Making Machinery

¶ For the past 60 years we have been specialists in the manufacture of screw-making machinery, for the making of metal screws with cut threads—universally used for all classes of woodworking.



¶ **Our vast experience and screw-making knowledge is at your disposal. Let us send you catalogue No. 25.**

The Asa S. Cook Company
Hartford, Conn., U.S.A.

Has Reduced Costs for Others—Will Do It In Your Shop

In nearly every instance where the Wisconsin Hand Miller has been installed—it has reduced production costs materially. This is on account of the many features which make for accuracy, convenience and speed that are found in the

Wisconsin Hand Miller

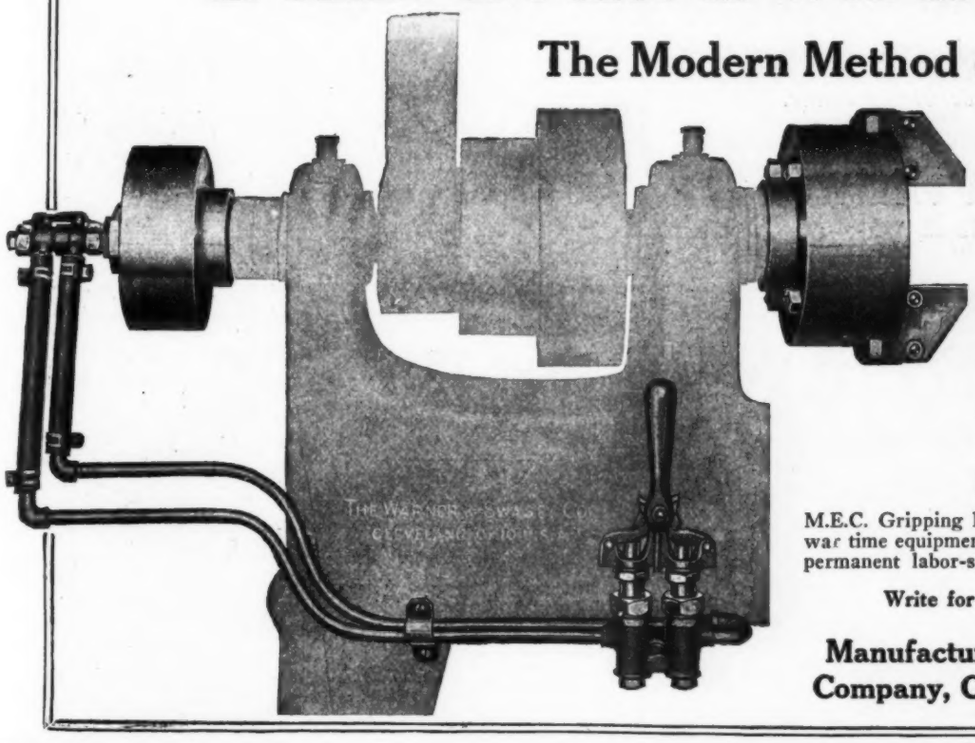
Designed for accurate and rapid finishing of small duplicate parts. It reduces costs—gives generally satisfactory results. Guaranteed for one year.

Write for the Wisconsin Bulletin.

Wisconsin Miller Mfg. Co.
Station A, Milwaukee, Wis.

M-E-C Chucking Devices Cut Production Costs in Times of Peace as Well as War

The Modern Method of Chucking



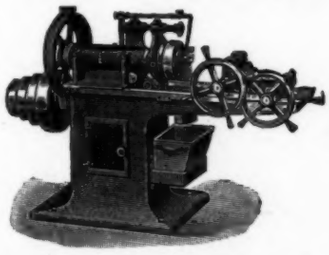
M.E.C. Gripping Devices were on the market before the war, but the necessity for greater production and more efficient manufacturing methods brought about by the war brought M.E.C. equipment into the limelight, owing to its wonderful labor-saving possibilities. M.E.C. Air-Operated Expanding Mandrels, Collets, Chucks, etc., are applicable to any and all machines where chucking is necessary and will cut the time of chucking 95 per cent. over the antiquated hand method.

M.E.C. Gripping Devices are not temporary war time equipment, but on the contrary, are permanent labor-saving devices.

Write for complete details.

Manufacturers' Equipment Company, Chicago, U. S. A.

Bolt Cutting At Higher Speeds



Many ingenious devices add to the working range and speed of the Acme Bolt Cutters.

Power is transmitted to working parts in a way to cut out the lost motion, thus making every movement productive without unnecessary wear.

All materials are the best for its service.

Write for Catalog which shows our complete line.

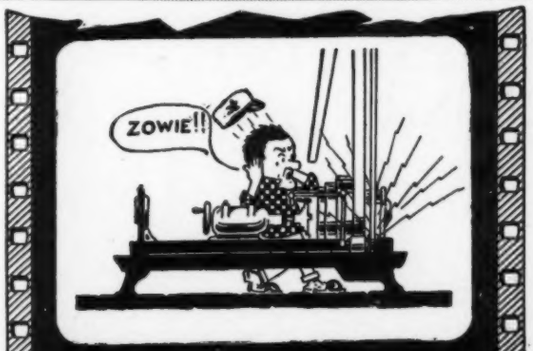
The Acme Machinery Company
Cleveland, O., U. S. A.

Perfect Alignment Makes Precise Punching

Waltham Sub-Presses maintain perfect alignment of punch and die regardless of the condition of the press or lack of skill in the operator. This insures absolutely accurate work and long life for the dies.

Write today for booklet and sample punchings.

Waltham Machine Works
High Street, Waltham, Mass.



Equip your machines with pumps that won't clog. Result—more production.

FULFLO

the trouble-proof pump

FULFLO **The Fulflo Pump Co.**
Blanchester Ohio

"Cleveland" Open Side Planers

Any size from 30 in. to 72 in., any length.

Write for the descriptive matter.

See first issue of each month for illustrations.

Cleveland Planer Co.
Cleveland, Ohio

We are manufacturers of Milling Machines, Milling Cutters, Special Tools, Profile Grinders and Plain Vises.

Write for information about any you are interested in before buying elsewhere—

The Cleveland Milling Machine Co.
Cleveland, Ohio

Cutters carried in stock by our agents

New York Office, 1760-2 Woolworth Bldg. Detroit Office, 705 Dime Bank Bldg.
Baltimore and Philadelphia, c/o D. Nast Machinery Company

CLEVELAND

Horizontal Boring Milling and Drilling Machine

Find out about this rigid, powerful, rapid producing, thoroughly modern machine. Centralized control makes easy operation. Adjustments against wear.

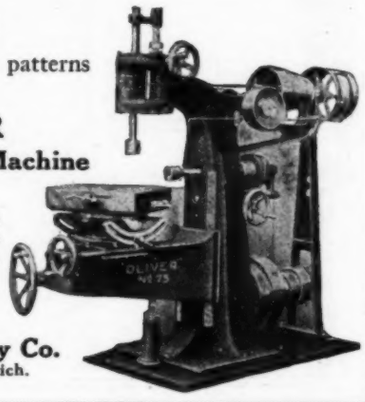
We'll be glad to send details

The Cleveland Machine Tool Co.
Cleveland, Ohio

Save 75%

By machining your patterns with the

OLIVER Wood Milling Machine



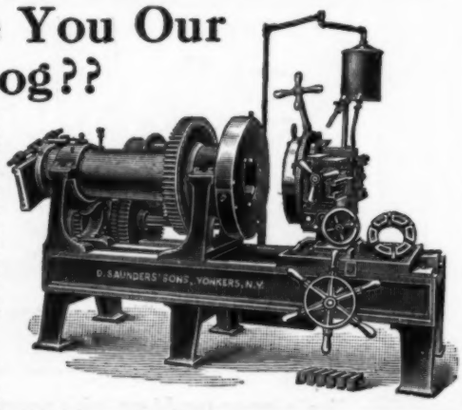
Its flexibility renders its range of operations practically unlimited.

Send for details.

Oliver Machinery Co.
Grand Rapids, Mich.

Have You Our Catalog??

If not, write us asking for Catalog "M"— a book describing in detail the many superior points regarding our famous line of **Pipe Cutting and Threading Machines.** We illustrate our No. 6 with patent adjustable expanding die head with interchangeable chasers.



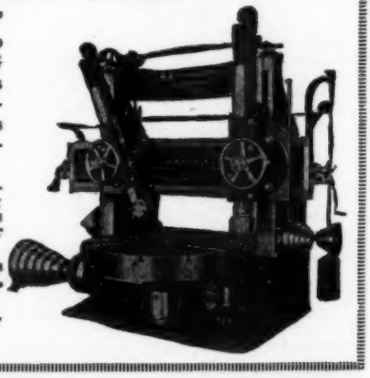
D. Saunders, Sons, Yonkers, N. Y.

The BICKFORD

is the creation of 27 years' exclusive devotion to VERTICAL BORING and TURNING. It has marvelous strength, rigidity and accuracy. Holds its original precision uniformly throughout.

Five sizes: 4 ft. to 8 ft. inclusive, one or two heads; rapid power traverse. Guides wide and true. Motor or belt driven.

Most interesting descriptions in our catalog. **Write for one.**



H. Bickford Company
Lakeport, N. H., U. S. A.

TWO TOOLS

work in the same cut on the Hurlbut Cutting-Off and Centering Machine. Twice the amount of work is turned out.

The Hurlbut-Rogers Machinery Co.
So. Sudbury, Mass.

OVER-SEAS REPRESENTATIVE
ALMACOA ALLIED MACHINERY COMPANY OF AMERICA ALMACOA
130 BROADWAY, NEW YORK, U.S.A.

MORRIS BENCH MILLER

This is a Bench Miller of the adjustable head type. It also can be mounted on column.

The spindle and back shaft run in bronze bearings.

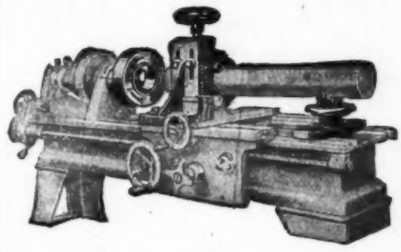
Six speeds are obtained through the three-step cone and by reversing the pulleys on the end of the spindle and the end of the back shaft.

Write for full particulars about this efficient and economical miller.

The Morris Machine Tool Company
Cincinnati, Ohio
The Oliver Machinery Co., Manchester, England

Your lathe and this tool will save money

Attach this new tool to your lathe and you have a power pipe-threading machine immediately; cuts perfect threads and does not require chasing tool. The die-carrying head attaches to the spindle like a chuck and the pipe is held in an adjustable vise attached to the carriage.



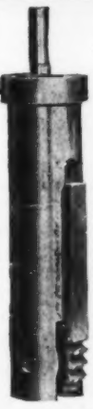
You need this attachment.

Write for catalog today.

THE CURTIS & CURTIS CO.
66 Garden St.
Bridgeport, Conn.

KEYSEATS

Milled by Rotary Cutter



A Drilling Machine Attachment That Can Be Used in Shops Large and Small

It mills straight keyseats in straight holes and straight keyseats in taper holes. It also mills taper keyseats in straight holes and taper keyseats in taper holes. It mills keyseats in places where Keyseating Machine, Shaper and Planer can't reach. This tool can be used for milling multiple keyseats, all equally spaced; an essential feature eliminating laying off keyseats which is a costly operation.

Write for Catalog D explaining full detail.

National Machine Tool Co.

2270-2272 Spring Grove Ave., Cincinnati, Ohio, U.S.A.

Exclusive agents for British Isles: Alfred Herbert, Ltd., Coventry, England. For Australia: R. L. Scrutton & Co., Ltd., Sydney, Australia.

Enlarge Your Working Capacity the "Davenport" Way

The wide range of screw machine jobs and the large output made possible on the Davenport Multiple Spindle Automatic Screw Machine, enlarges the working capacity of any shop having this kind of work to do.

There's no sacrifice in accuracy or finish to get the "Davenport" output.

Many users say that they have taken on business which could never be touched under old production costs.

Let us send you our Catalog. Now?

Davenport Machine Tool Co., New Bedford, Mass.

SHAPERS

Smith & Mills Company, Cincinnati, Ohio, U. S. A.

Foreign Agents—C. W. Burton, Griffiths & Co., London. G. & F. Limbourg, Freres, Brussels. Van Reitschoten & Houwens, Rotterdam. Gleanzer Perreaux & Thomine, Paris. Stussi & Zwiefel, Milan.

KELLY SHAPERS

Have the advantage of being the sole machine tool product of an organization of specialists. They possess correct design, unusual accuracy and are easy to operate. Three sizes single geared, four sizes back geared. **Write for a Catalog.**

THE R. A. KELLY COMPANY, Makers of Shapers only for 25 years
P. O. BOX 488 XENIA, OHIO, U. S. A.

Send Us Your Inquiries for

BOLT, NUT, FORGING AND WIRE NAIL MACHINERY

THE NATIONAL MACHINERY CO. TIFFIN, OHIO, U.S.A.

WE are manufacturers of Lincoln Type Milling Machines, Bench Milling Machines, Hand Milling Machines, and a line of reliable Screw and Lever Vises. Get our circulars and prices.

THE CARTER & HAKES MACHINE CO.
Winsted, Conn., U. S. A.

"STOEVER" PIPE MACHINE

The machine with 25 per cent greater capacity, size for size.

TREADWELL ENGINEERING CO., Easton, Pa.

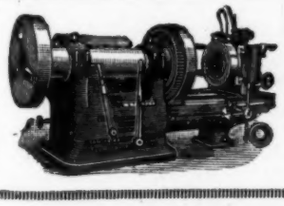
COLUMBIA SHAPERS

Newer and Better

Heavy Duty Shapers of unusual merit. 16, 20, 24 and 28-inch.

Write us for details

The Columbia Machine Tool Co., Hamilton, Ohio



Tube Mill Machinery—Seamless and Welded.
Rolling Mill Equipment. Rolls—Sand and Chilled.
Pipe Threading and Cutting Machinery.
Castings—Gray Iron, Semi-steel, Cupola and Air Furnace.
Machine Work to drawings.

Standard Engineering Works, Ellwood City, Penna., U. S. A.

OTHER JOINTS HAVE NOTHING ON THIS

The belt repairs made on Jackson Belt Lacing Machines are equal in every respect to joints in endless belts made by skiving and gluing. The Jackson cost is one cent and three minutes time. You know what the other is. Want the Jackson Book?

Birdsboro Steel Foundry & Machine Co., **Birdsboro, Penn.**

Are you posted on the KELLER METHOD of AUTOMATIC DIE-CUTTING?

KME

Don't Assume. Investigate.

KELLER MECH. ENG. CO., 76 Washington St., Brooklyn Boro. N. Y. C.

Pawling and Harnischfeger

Horizontal Drilling and Boring Machine

Specifications:

Motor 7½ hp. variable speed 500 to 1500 r.p.m.; horizontal spindle travel, 3 ft. 0 in.; vertical carriage travel, 6 ft. 5 in.; column travel, 11 ft. 6 in.; diameter of spindle, 3½ in.; Morse taper, No. 6; spindle speeds variable from 10 to 450 r.p.m.; feed changes for each spindle speed, 4; feed per revolution of spindle, .008 in., .016 in., .18 in., 7 in.; weight, including motor and controller, 24,500 lbs.

For heavy boring operations on large hard to manage parts this machine presents many distinct advantages.

Where the slightest error in boring may prove serious in the finished product, this machine is considered indispensable because of its absolute accuracy.

Read the specifications opposite

QUALITY P&H SERVICE

Dale-Brewster Machinery Co., Inc.
New York Store, 54-60 Lafayette Street
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LANDIS DESIGN

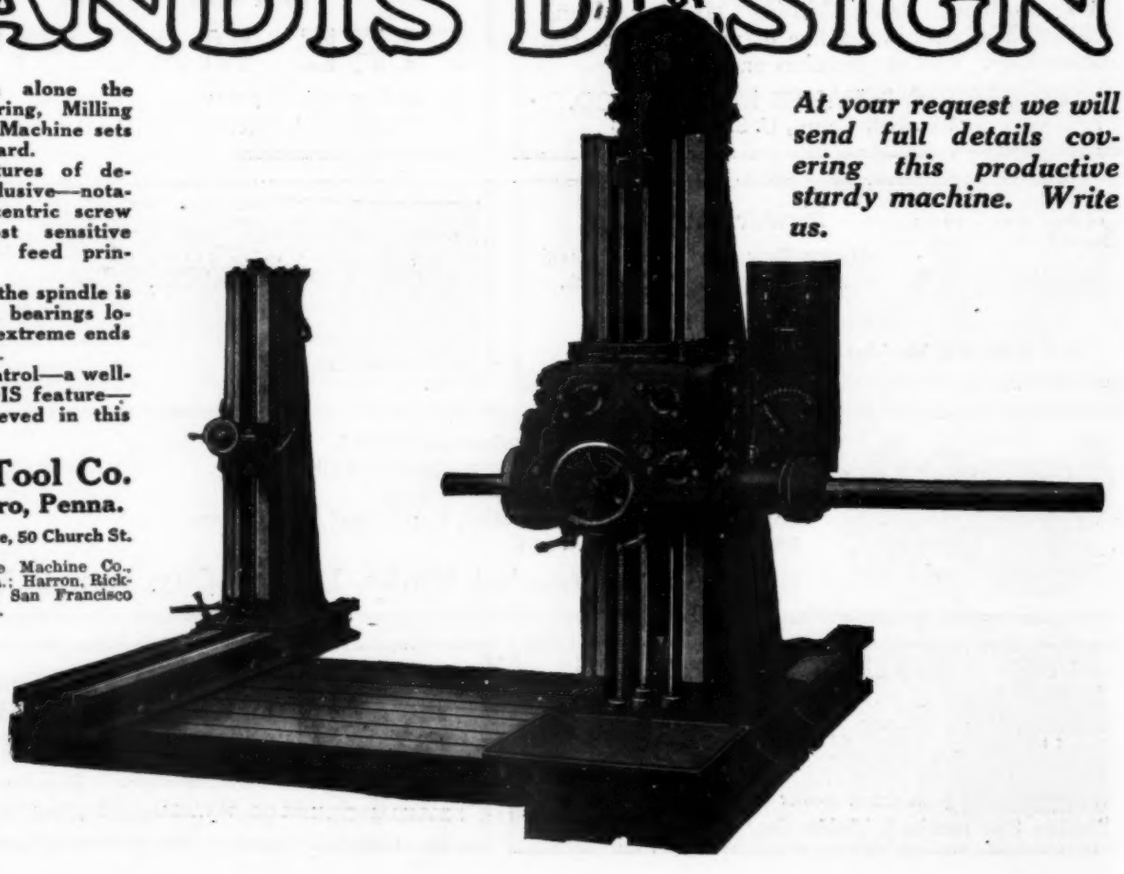
In design alone the LANDIS Boring, Milling and Drilling Machine sets a high standard.

Many features of design are exclusive—notably the concentric screw feed—a most sensitive and positive feed principle.

Moreover, the spindle is supported on bearings located at the extreme ends of the saddle.

Ease of control—a well-known LANDIS feature—is fully achieved in this machine.

At your request we will send full details covering this productive sturdy machine. Write us.

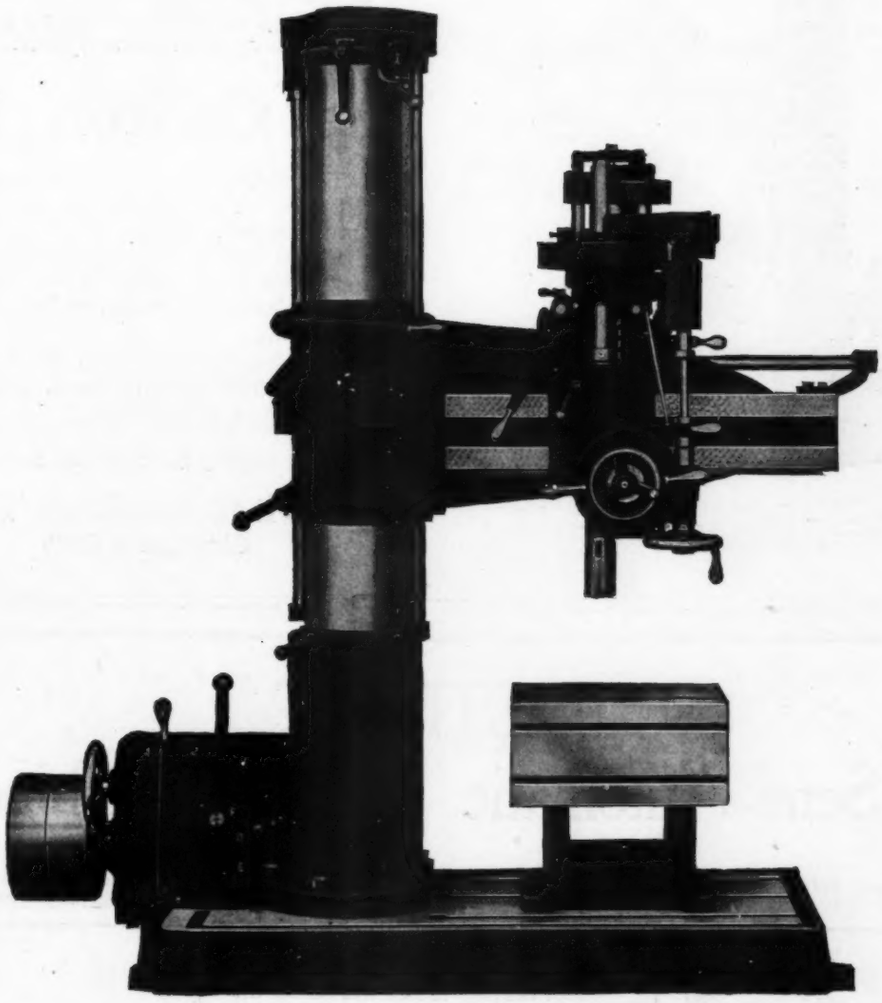


Landis Tool Co.
Waynesboro, Penna.

New York Office, 50 Church St.

Agents: Dewstoe Machine Co., Birmingham, Ala.; Harron, Rickard & McCone, San Francisco and Los Angeles.

The Mueller Radial Drill Sets a New Pace



Manufacturers throughout the country are surpassing old production records through its use.

The Mueller Radial Drill is remarkably simple and easy to handle.

Its entire structure is firm, rugged and capable of enduring stress and strain.

Column is cast in one piece and has four internal webs extending its entire length, which adds to its rigidity.

Arm is made in pipe section and it is practically impossible to twist it.

Spindle has 12 changes of speed, all instantly available without stopping machine.

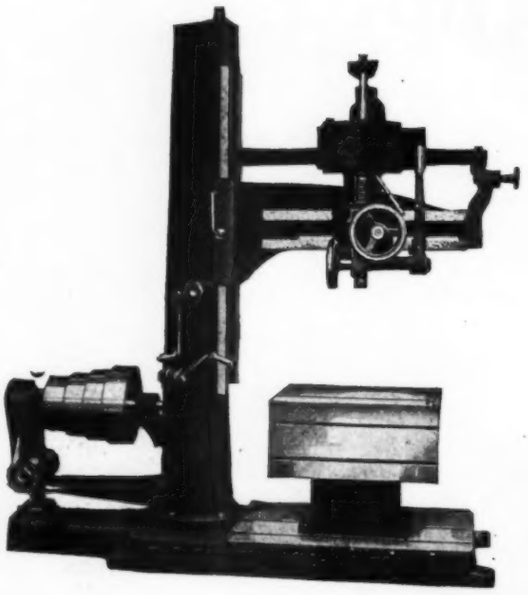
We would like to hear from those interested

THE MUELLER MACHINE TOOL COMPANY

Radial Drills and Lathes

CINCINNATI, OHIO, U. S. A.

High speed steel is its only limit



Designed to drive ¼- to 1-inch high-speed twist drills to capacity. All running parts are accurately balanced and carried on imported annular ball bearings, thoroughly protected from dust and injury and so arranged that no running part rides upon a stationary one.

The Carlton Drill

The all-belt drive makes it practically noiseless. The spindle can be rapidly traversed by a handwheel at the left of the head, and it is fed by a lever on the right, this lever having a ratchet so it can be placed in most convenient position for drilling.

When desired, we can furnish this machine with variable speed motors.

Sizes 2½, 3, 3½ and 4 feet.

Write today for complete details.

The Carlton Machine Tool Co.
Cincinnati, Ohio

DETROIT
Semi-Automatic Drilling Machine

AIRPLANE FORK ENDS
800 PER HOUR

You Guarantee Production

by using this machine, because the operator has only to load and unload the fixtures.

The loading time determines the production.

Suppose the operator can load and unload the fixture in 4 seconds.

Then the production will be 15 pieces per minute and the allowable time for drilling each hole is 16 seconds, since 4 spindles are working while the remaining spindle is idle during the loading period.

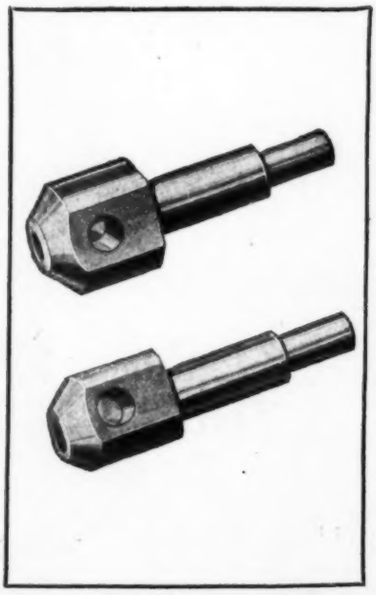
Production Encourages Patriotism } **Abbreviated "Pep"**

Let our Engineering Department work out your problem for you.

Better write right away to

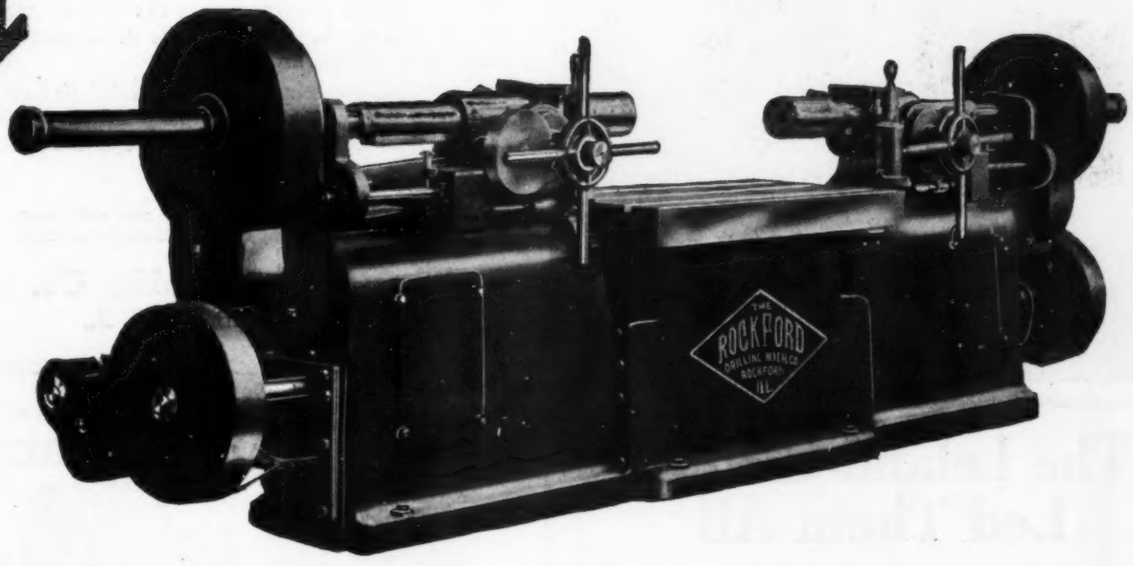
Detroit Tool Company
Detroit, Mich.

RIFLE GRENADE FUSE
CONTAINERS—1000 PER HOUR



ROCKFORD

BORING MACHINE for CRANK CASE WORK



Here's another Rockford Special Box Column Boring Machine for Crank Case work.

Like all the Rockford special purpose machines this crank case borer is stripped of unessentials; every detail is made with the one end in view. Each part cooperates with every part, resulting in a harmonized working unit.

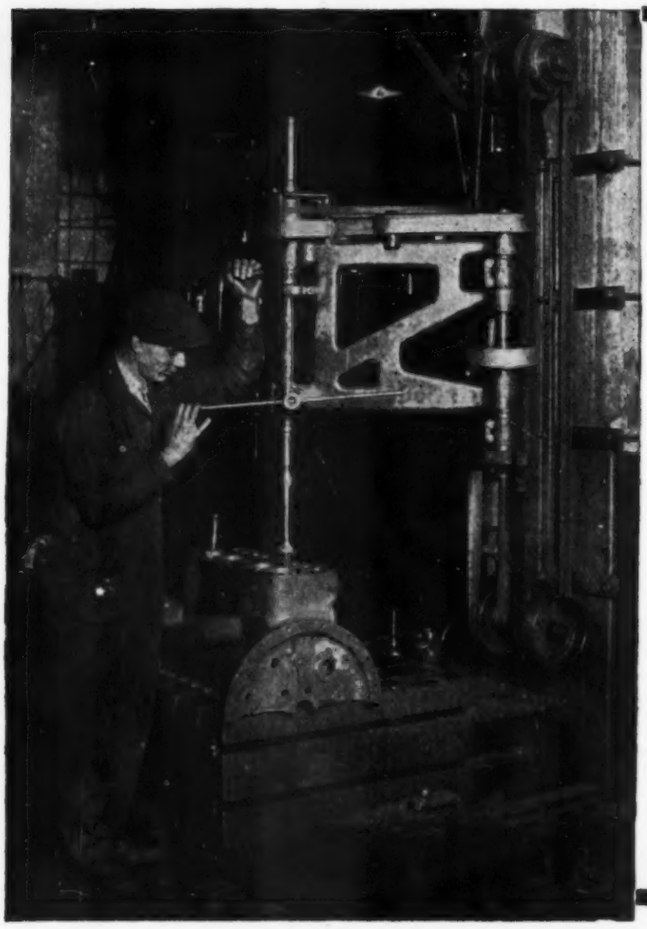
A special direct motor drive is provided, and a special spindle nose with hardened bearing strips and drive slot for milling cutter. The base and table are made short for this particular machine.

There's a Rockford for your work—a special machine to meet your needs more than half way. Let us know the work you are handling.

ROCKFORD DRILLING MACHINE COMPANY

Rockford, Illinois

L. L. Essley Machinery Co., 551 Washington Blvd., Chicago, Ill.
Marshall & Huschart Machinery Co., 334 N. Capitol Ave., Indianapolis, Ind.
Marshall & Huschart Machinery Co., 905 Chemical Bldg., St. Louis, Mo.
Henry Prentiss & Co., Inc., Singer Bldg., New York City, N. Y.
Henry Prentiss & Co., Inc., 724 Prescott Ave., Scranton, Penna.
Herberts Machinery & Supply Co., 405 E. Third St., Los Angeles, Cal.
Henry Prentiss & Co., Inc., 607 D. S. Morgan Bldg., Buffalo, N. Y.
Henry Prentiss & Co., Inc., 49 Federal St., Boston, Mass.
Henry Prentiss & Co., Inc., 520 University Block, Syracuse, N. Y.
Henry Prentiss & Co., Inc., 315 E. & B. Bldg., Rochester, N. Y.
Somers, Fitler & Todd Co., 323 Water St., Pittsburgh, Penna.
Monarch Machinery Co., 300 N. Third St., Philadelphia, Penna.
Strong, Carlisle & Hammond Co., 270 Jefferson Ave., Detroit, Mich.
Strong, Carlisle & Hammond Co., 326 Frankfort Ave., N. W., Cleveland.



Speed and Accuracy

THESE Fordson Tractor Cylinder Castings must be accurate—yet a big production is required. To meet these requirements, The Ferro Machine & Foundry Co. installed Hammond Radial Light Drilling and Tapping machines. They are enthusiastic over the results obtained.

HAMMOND
Sensitive High-Speed
Radial Drills

Especially built for light drilling and tapping work. A single motion brings the drill over any part of the work. Great range of adjustment. Drill radius 48 inches.

Entirely self-contained—just "hitch" to belt or motor. Three spindle speeds—380, 625, 1000 r.p.m. Can be arranged to give spindle speeds up to 2000 r.p.m.

Write and find out how you can cut your light drilling and tapping costs 25% to 33%

The Hammond Mfg. Co.
Cleveland, Ohio, U. S. A.

The Leland-Gifford Led Them All

The first machines to establish correctness of 10,000 r.p.m. for high-speed drilling. .

Made in from one to six spindles. Annular ball bearing throughout. Vibration reduced to a minimum. Size up to ⅜ in. Twelve-inch swing.

Send for Bulletin 502

Leland-Gifford Company
Worcester, Mass.

PREVENT TAP BREAKAGE

THE HARRIS PRECISION TAPPING MACHINE

Preserves continuously the exact alignment of the tap with its hole.

Cushions the reverse so that there is practically no shock on the tap.

Has a fine adjustment for exact depth, which prevents the tap bottoming too far in a blind hole. Eliminates all length-wise pull on the tap.

Those features enable the unskilled operator to operate the "Harris" at high speed, without a large percentage of tap breakage.

You can get more threads per tap—cleaner threads per tap—with the Harris Precision Tapping Machine.

Write for full details.

The H. E. Harris Engineering Co.

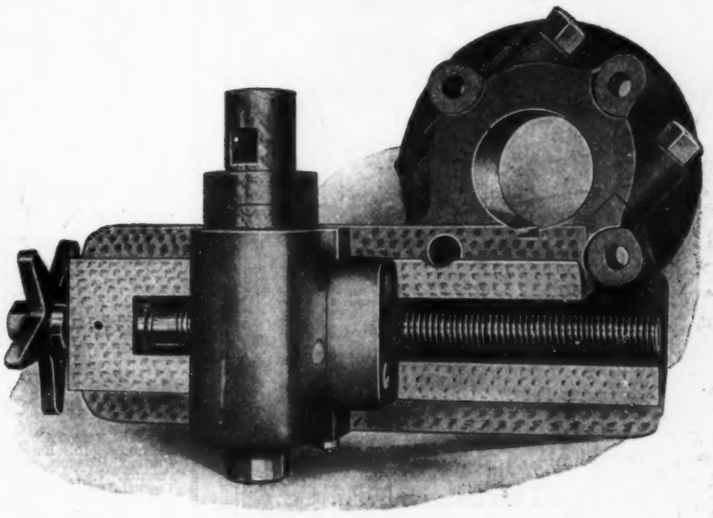
"The Bridgeport Tool Shop"

Mark of Quality

Symbol of Service

Bridgeport Conn.

UNIVERSAL BORING MACHINE

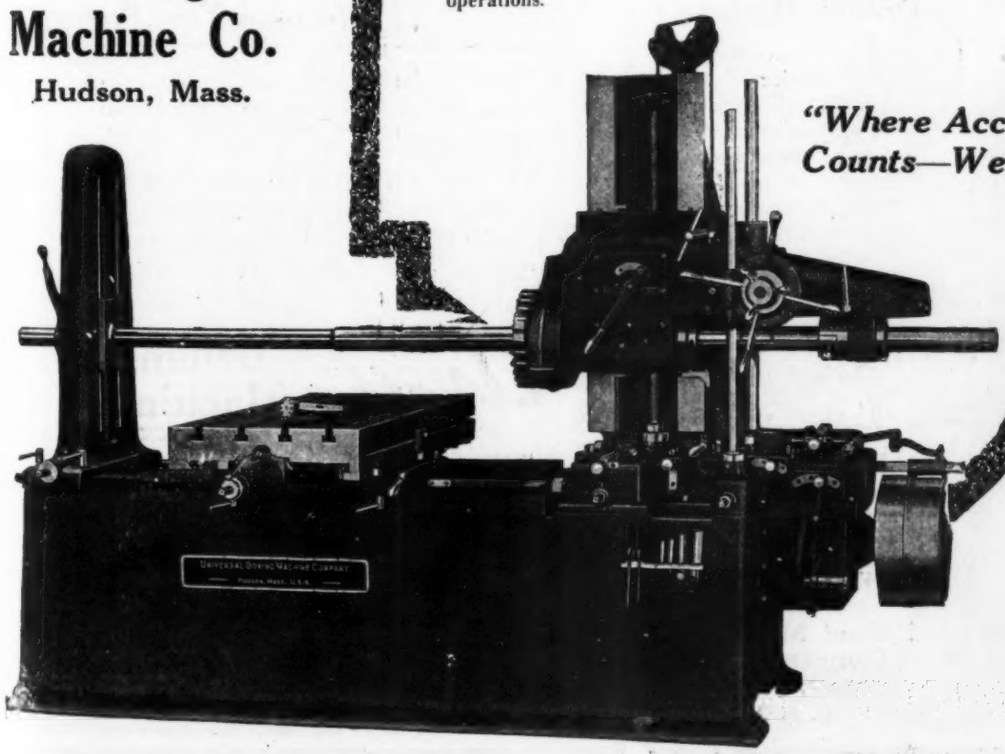


Facing Head with Star Feed

For all-'round efficiency—for low cost operation, speed and accuracy—for ability to handle a varied line of special jobs bound to appear in every shop—the Universal Horizontal Boring Machine has won a reputation for meeting the situation as no other machine does. Illustrative of the "Universal" special features we show herewith our Facing Head with Star Feed, having capacity for facing up to 20 inches. Facing Head can be used anywhere on the bar and still obtain feed—no complicated mechanism—a greater economy in many operations.

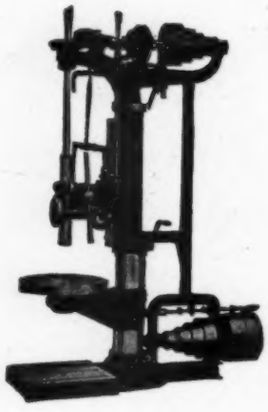
Universal Boring Machine Co.
Hudson, Mass.

"Where Accuracy Counts—We Win."



We can quickly demonstrate why the Universal will prove best for your work—just say you're interested and we will send convincing facts.

Silver's 25-Inch Drills



Write
The Silver Mfg. Co.
360 Broadway
Salem, O.

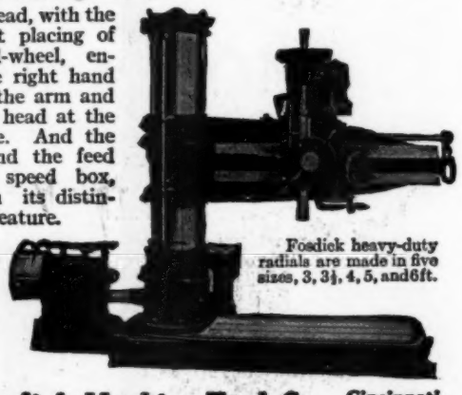
Fosdick Heavy Duty Radials Are Built for Skeptics

For the men to whom mere claims mean nothing.

These we urge to analyze the Fosdick. Their decision will satisfy us.

We ask them to look at its column, with its annular and thrust ball bearings that insure easy swinging of the arm. And the arm, with its greatest possible resistance to torsional and bending strain.

And the head, with the convenient placing of the hand-wheel, enabling the right hand to swing the arm and move the head at the same time. And the spindle and the feed and the speed box, each with its distinguishing feature.



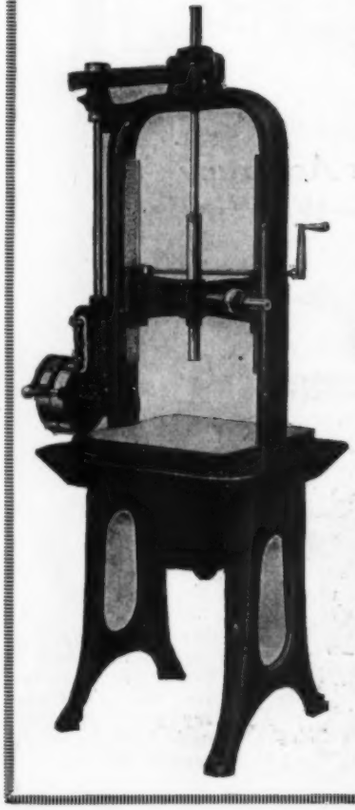
Fosdick heavy-duty radials are made in five sizes, 3, 3½, 4, 5, and 6ft.

These are included in the catalog. We have a copy for you.

The Fosdick Machine Tool Co., Cincinnati, Ohio

Biggs-Watterson Co., Cleveland, Ohio. Colcord-Wright Mchy. & Supply Co., St. Louis, Mo. Eccles & Smith Co., San Francisco, Cal.; Los Angeles, Cal.; Portland, Oregon. Fairbanks Co., New York City, N. Y.; Hartford, Conn.; Albany, N. Y. E. A. Kinsey Co., Cincinnati, Ohio; Indianapolis, Ind. J. L. Osgood, Buffalo, N. Y. Peninsular Machinery Co., Detroit, Mich. H. A. Smith Machinery Co., Syracuse, N. Y. Swind Machinery Co., Philadelphia, Pa. Somers, Fitler & Todd Co., Pittsburgh, Pa. Stocker-Rumely-Wachs Co., Chicago, Ill.; Milwaukee, Wis. Taylor Machinery Co., Boston, Mass. A. R. Williams Machinery Co., Ltd., Toronto, Ont., Canada. Burton Griffiths & Co., London, England. Fenwick Freres & Co., Paris, France. Wynmalen & Hausmann, Rotterdam, Holland. Rylander & Asplund, Stockholm, Sweden. Wilh. Sonnesson & Co., Malmo, Sweden; Copenhagen, Denmark. Roku Roku Shoten, Tokyo, Japan. R. L. Scrutton & Co., Sydney, Australia.

THE EDLUND



Sensitive Drilling Machine

has no overhang arm subject to springing off center. No menace to safety of drills. Four changes of speed—all within easy reach of operator.

Exact Alignment Assured

Table is fastened to pan at three points. All chips and oil taken care of by chip pan under table. Silent chain drive. Fitted with crank for raising and lowering cross arm.

Write for details

Edlund Machinery Company, Inc.
Cortland, New York
U. S. A.

Automatic Drilling

Let Avey Automatics Increase Your Profits

That's what they are doing in many machine shops throughout the country.

AVEY Drilling Machines are replacing inefficient equipments in plants where there is no desire to merely "get along" but where the aim is for larger and larger output.

Avey Drilling Machines

have characteristic features that enable you to speed up work, to meet the demand in modern intensive production.

Eventually you'll buy Avey Drilling Machines

The Cincinnati Pulley Mchy. Co.
Cincinnati, Ohio

If a Spindle Belt Gives Out

on this machine it can be renewed in 10 seconds.

ITS A TRADE MARK SIPP

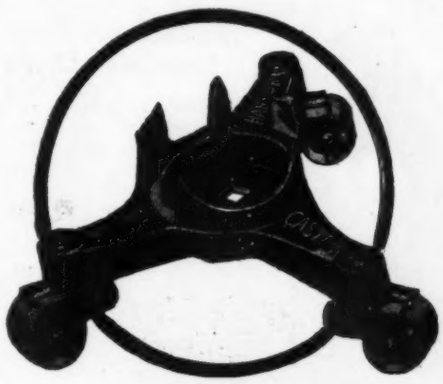
How Long Does It Take

on the machine you are using?

Write for Bulletin No. 4

THE SIPP MACHINE CO.

Erie R.R. Ave., PATERSON, N. J.



21,060 Holes Per 10-Hour Day

This is the rate of production made by a Hoefer Auxiliery Head. Drilling three holes through 13/16 in. metal on Harper stove casters.

Here are the figures:

Feed, ¼ in. in four seconds. Three 17/64 drills driven at 1500 R.P.M. 11.7 pieces per minute—7020 pieces per 10-hour day—21,060 holes per 10-hour day.

In order to keep the machine supplied with castings it required 14 molders working all the time handling the patterns, three on a gate.

Get in touch with the Hoefer Method.

HŒFER MFG. CO.

Freeport, Ill., U. S. A.

HENRY & WRIGHT

Drilling Machines

A tremendous increase in the understanding of drilling for manufacturing always follows the use of all *Henry and Wright Machines*

Class K
Number 5

The Henry & Wright Mfg. Co.

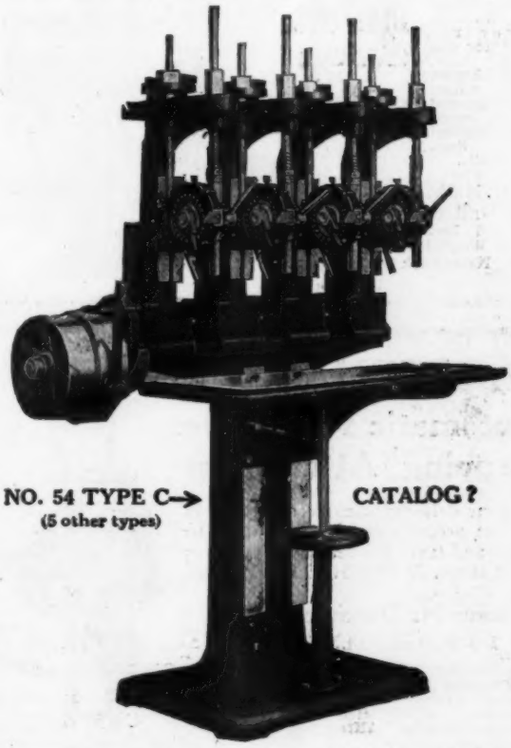
Hartford, Conn.

Foreign Agents: Allied Machinery Co. of America, New York, N. Y.
Paris, Turin, Zurich and Barcelona

THE TAYLOR & FENN CO.

HARTFORD, CONN.

GEAR AND SILENT CHAIN DRIVEN DRILLING MACHINES



NO. 54 TYPE C→
(5 other types)

CATALOG?

An Acknowledged Leader in Drills

Our 20-in. all-geared, self-oiling drill, is noted for continuous high speed production. Abundant power, instant, easy control. Speed changes 8; feed changes 8.

Catalog A has the details.

Barnes Drill Co. Incorporated 1907

830 Chestnut St., Rockford, Ill., U.S.A.

Agents for Great Britain: C. W. Burton, Griffiths & Co., London, E.C. **France:** R. S. Stokvis & Fils, Paris. **Japan:** Roku-Roku Shoten, Tokio. **Italy:** Alfred Herbert, Ltd., Milan. **New South Wales:** Messrs. R. L. Scrutton & Co., Sydney.

VICTOR Collapsing Tap

Cuts perfect threads, trips positively, operates rapidly, is built strong and durable. The very tool you need for that hard shell work.

We guarantee satisfactory work.
Right prices.

Prompt Delivery ***Let Us Prove It***

Write today for Circular No. 10.

Victor Tool Company
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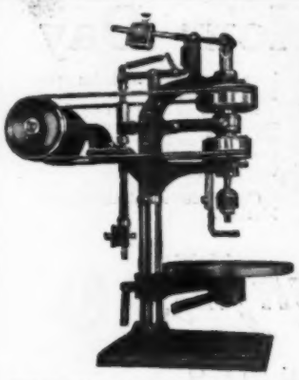

It's Hard To Break A Tap On The "Tuttle"

Tuttle Tapping Machines are serviceable tools for quantity productions of accurate work. Although sensitive machines they will stand the abuse of unskilled operation. "Tuttles" save taps and temper. Made in two styles: for hand lever and foot lever operation.

Our Booklet gives details of both machines. Send for your copy now.

EVANS STAMPING & PLATING CO., Taunton, Mass.

Where Better Drilling Is Desired

Accuracy and fine finish and workmanship distinguish Sigourney Drill Presses. They are the finest built Sensitive Drilling machines on the market. Guaranteed to run absolutely true. Made with one, two, three and four spindles.

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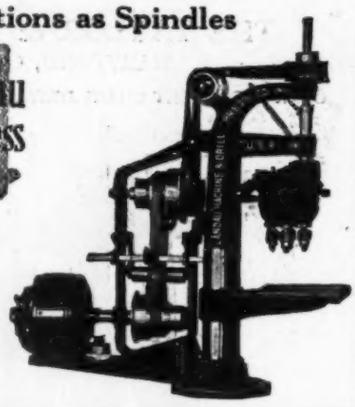
The Sigourney Tool Co.
Hartford, Conn.

As Many Operations as Spindles with the Landau Drill Press

For each spindle acts as an independent machine. Power required for one spindle only. Three different speeds which can be changed quickly. Bench and Pedestal Styles. Send for details.



Landau Machine and Drill Press Co., Inc.
19-25 West 44th Street
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High Speed Drills and Key-Seaters

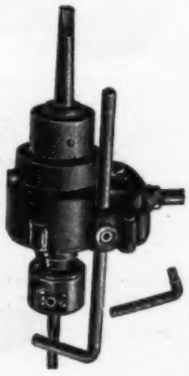
Both are world famous. Let them increase your profits as they are doing for so many others. Interesting catalogs sent on request.

Baker Brothers, Toledo, O., U.S.A.

DORMAN Automatic Reversible Tapping Attachment

on your drilling machine and you can do fast, accurate tapping with the least wear and tear. Proved in hundreds of good shops. Will prove itself in yours.

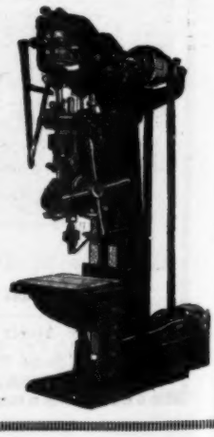
John H. Dorman & Son
1-9 Bethune St., N. Y. City



Sole Agents for Great Britain, Belgium, Switzerland, China, Japan and India: Alfred Herbert, Ltd., France, Societe Anonyme; Alfred Herbert, Paris; Italy, Societa Anonima; Alfred Herbert, Milan.

If You Want to Know How to Reduce Operating Costs, Investigate the

TURNER TURRET



Combines the accuracy and productive range of a high-class turret lathe with the power and speed of a heavy duty drill press.

Turner Machine Company
Danbury, Conn.

and Newark, N. J., U. S. A., Incorporated with Turner, Atherton & Co., Ltd., Denton, Manchester and Stockport, Eng.

Faster Tapping Production

"WOODSTOCK"
Reversing Tapping Attachment

Quick reversal of the tap when its work is done means better production. The Woodstock Reversing Tapping Attachment operates by raising the spindle. The Woodstock Safety Chuck saves tap breakage. A combination of the two means 100 per cent. tapping efficiency.

Peter Bros. Mfg. Company
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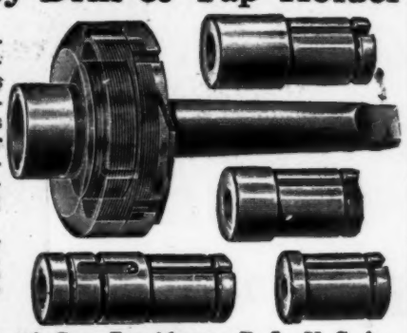
Messrs. A. A. Jones & Shipman, Leicester, England; L'Outillage Mecanique, 16 Rue Dupont De L'Eure, Paris, France, carry a complete line of these chucks.

Ask us about our 30-day Free Trial Offer

The Safety Drill & Tap Holder

is the only attachment for the purpose that gives universal satisfaction and is **Unequaled for Efficiency, Convenience, Rapidity, Accuracy and Simplicity.**

Nothing to *break* or get out of *order*. Made in 4 sizes covering from 0 to 2½ in. diameter.



The Beaman & Smith Co., Providence, R. I., U. S. A.
Builders of Boring and Milling Machines, and Special Machines for such Purposes Constructed.

"Five in One"
The Fortin Turret Head
(Patent Applied for)

Will Drill, Ream, Counterbore and Spot-Face Without Moving Your Work

Makes a Single Spindle Drill Machine into a Five Spindle. Changes from one spindle to the other either way, instantly while in operation. Runs quietly and smoothly at same speed as drilling machine. Consumes no extra power. All spindles ball bearing. A money, space and time saver. Can be applied to any drilling machine.

Write today for full information and prices.

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Highest Efficiency — Utmost Economy

"Hole Hog" Multiple Drillers and Borers increase the output and reduce production costs. Save in every direction. Increase the capacity of your plant by using "Hole Hogs" instead of building an addition. Tell us your needs.

MOLINE TOOL COMPANY. **Moline, Illinois**

Drill Two Holes for the Cost of One

You can do it with a Nelson two-spindle adjustable drill head.

Let us send you complete information.

Nelson-Blanck Mfg. Co., Clay and Dubois St., Detroit, Mich.

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Twist Drills 100% Efficient

When Ground on an American Drill Grinder

The patented calipering device and drill holder are features of the American that have never been duplicated.

These features insure proper clearance for all size drills and mechanically perfect cutting edges at all times. You can't grind drills wrong on an American.

Drills ground on an American are 100% efficient —they have no tendency to feed off center— they cut faster and do not burn or break.

The never failing accuracy, the simplicity, superior construction and exclusive design of American Drill Grinders easily place them in a class by themselves. Built for wet or dry grinding—belt or motor drive. Our literature describing American Drill Grinders and La Salle Surface Grinders should occupy a prominent place in your files—May we send it?

La Salle Tool Company

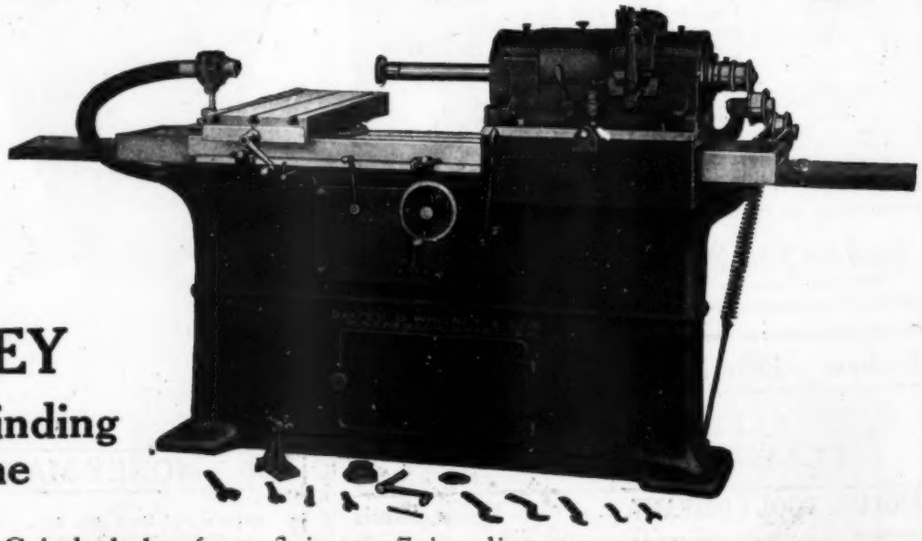
La Salle, Ill., U. S. A.

Better Compression—Less Leakage

by finishing Aeroplane and Automobile Engine Cylinders on a

WHITNEY

Cylinder Grinding Machine



Grinds holes from 3 in. to 7 in. diameter.
Equipped for wet or dry grinding as desired.

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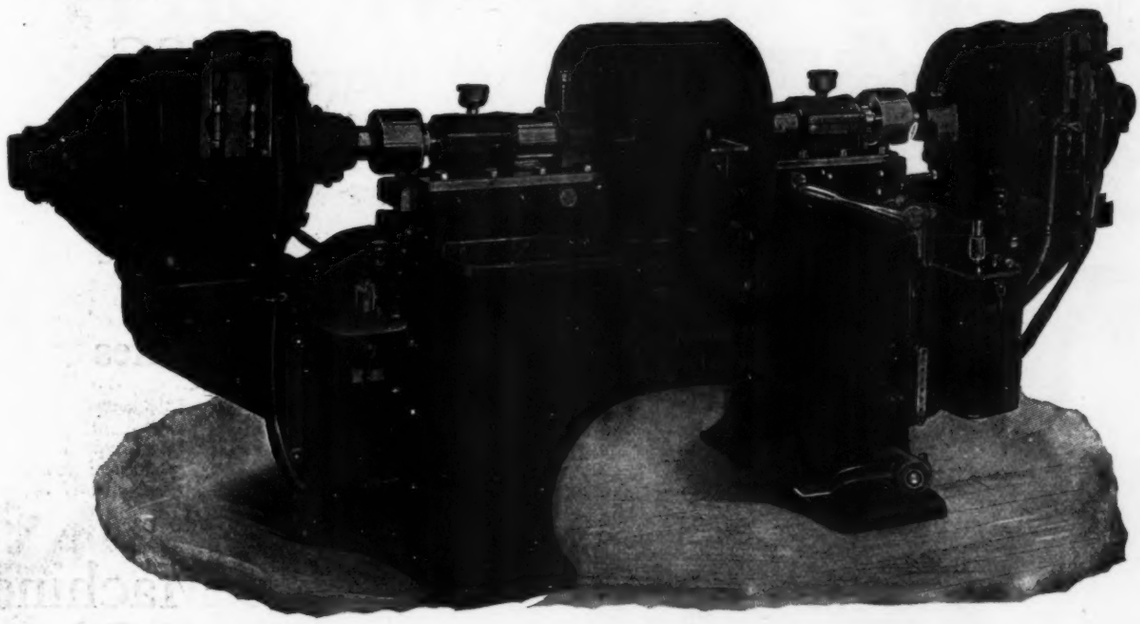
Baxter D. Whitney & Son, Winchendon, Mass., U. S. A.

Domestic Agents: Machine Tool Engineering Co., New York City. E. A. Kinsey Co., Cincinnati, Ohio. Strong, Carlisle & Hammond Co., Cleveland, O., and Detroit, Mich. The Motch & Merryweather Machinery Co., Pittsburgh, Pa. Pacific Coast Agents: Portland Machinery Co., Portland, Ore. Perine Machinery Co., Seattle, Wash. **Canadian Agents:** Canadian Fairbanks-Morse Co., Montreal, P. Q. **Foreign Agents:** Buck & Hickman, Ltd., London, England. Fenwick Freres Co., Paris, France.

Speed Up Production!



Gardner Disc Grinders

The advantages of the disc grinder as an economical production tool have come to be generally admitted. In all countries of the world engineers are marking drawings "disc-grind" where they were formerly marked "mill," "plane," "turn," etc.

A Gardner Disc Grinder of a suitable size and type applied to your work will materially affect your production both from the standpoint of volume and cost.

Our Experimental Service

We maintain a special department of skilled mechanics for determining the adaptability of Gardner Grinders to various classes of work. This service is at your disposal gratis. Send us a number of unfinished pieces, together with one piece finished to requirements by your present method. We promptly make a demonstration on the parts, advising you in detail just what type and size of machine is required, what output can be expected, accuracy obtainable, maintenance cost, etc. All our reports are conservative and can be equaled or bettered in actual practice.

ABRASIVE DISCS

The use of Gardner Abrasive Discs is a certain means of securing the best disc grinder results. They meet every requirement. Do not confuse them with ordinary emery discs. They are made of a heavy coating of artificial abrasive grains, carefully screened to size and bonded to a tough cloth backing and trimmed close to size. When properly selected and applied to the work in hand they are long-lived and will cut fast and cool.

"ADAMITE" Discs—For Steel, Malleable Iron, Aluminum and Brass.

"AMALGITE" Discs—For Cast Iron, Carbon, Copper, Clay and Cork.

Write today for our big general catalog.

GARDNER MACHINE COMPANY, Beloit, Wisconsin, U. S. A.

Disc Grinders for Metals and Wood, Ring Wheel Grinders, Polishing and Buffing Lathes, Abrasive Discs for Metals and Wood, Disc Grinder Accessories, Fixtures and Supplies.

GARDNER

OVER-SEAS REPRESENTATIVE

ALMACOA — ALLIED MACHINERY COMPANY OF AMERICA — ALMACOA

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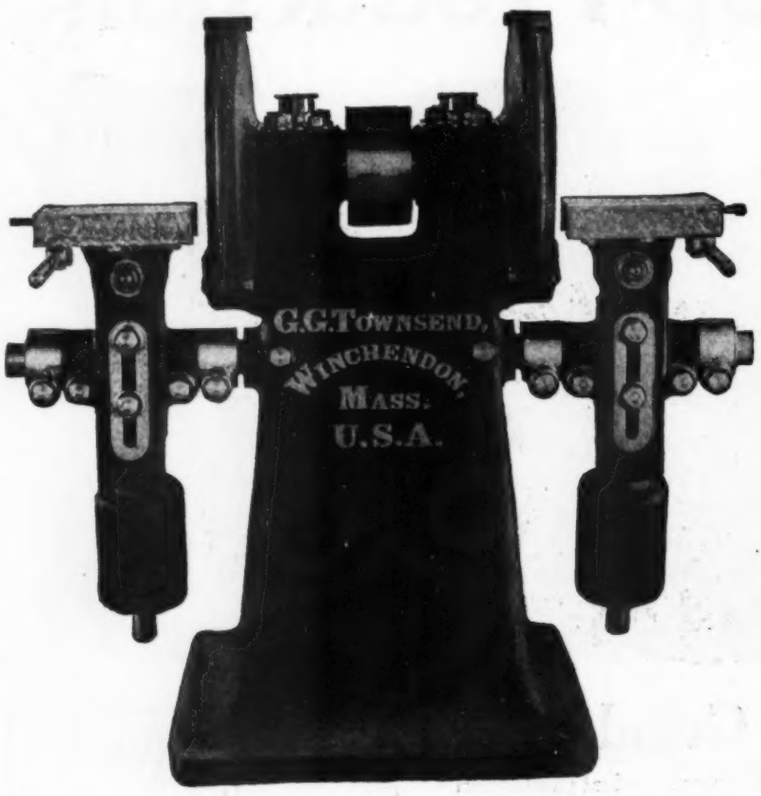


TOWNSEND DISC GRINDERS

18 inches
and
24 inches

Built by

G.-S. Machine Tool Co.

Fitchburg, Mass.

Wet Tool Grinding

Why not try a special WALTHAM 233-0

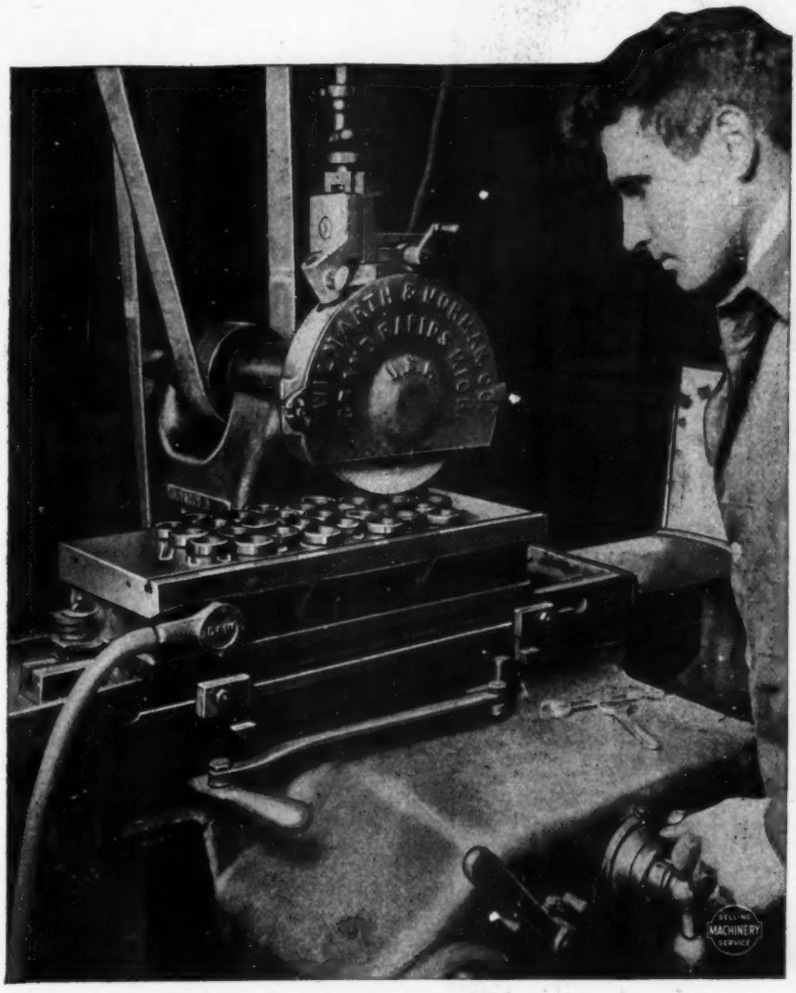
for lathe and planer tools

Sent on Approval
Write for particulars

Waltham Grinding Wheel Co.
Waltham, Mass.

The W & M No. 2

On a Simple but Important Operation



Ann Arbor, Michigan, is famous for a number of things—among them the Parker Drill Chuck, sole product of a well equipped factory. Face grinding the nuts for these chucks—a simple but important operation—is performed on this Wilmarth & Morman No. 2 Surface Grinder, 31 being accommodated on the magnetic chuck at one setting. The extremely rigid spindle bearing on this machine practically eliminates overhang of the arm and permits removing .125 in. of stock at a time. In this case only .005 in. is removed; but the rigidity of the machine allows a highly profitable feed to be used without imperilling accuracy. Other features fully described in our catalogue—send for a copy.

Wilmarth & Morman Company

Master-Grinder Makers

1187 Monroe Ave., N.W. **Grand Rapids, Mich., U. S. A.**

Manufacturers of Drill Grinders **Surface Grinders, Universal Grinders**

The
VITRIFIED
clean cut for clean cutting

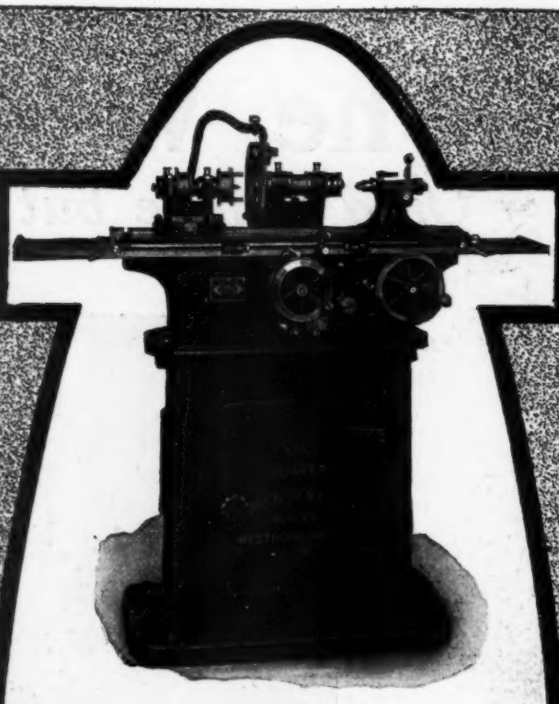
A clean-cut, perfectly uniformed porous structure, welded by heat—this is the Vitrified Wheel.

It cuts fast, lasts long and keeps tools cool.

The Vitrified Wheel not only improves the quality of your work, but increases your production.

Remember—it's the Vitrification that makes the difference. We'll gladly tell you about the process.

Vitrified Wheel Co.
Westfield, Mass.



No. 1 Fraser Universal Convertible Grinder

is particularly efficient on **tools, jigs, fixtures** where speed of working is as desirable as exacting preciseness.

On such work it will give better efficiency than is possible on the bigger, heavier machines intended for production work. Its universal convertibility enables it to be used on work which would otherwise require several machines.

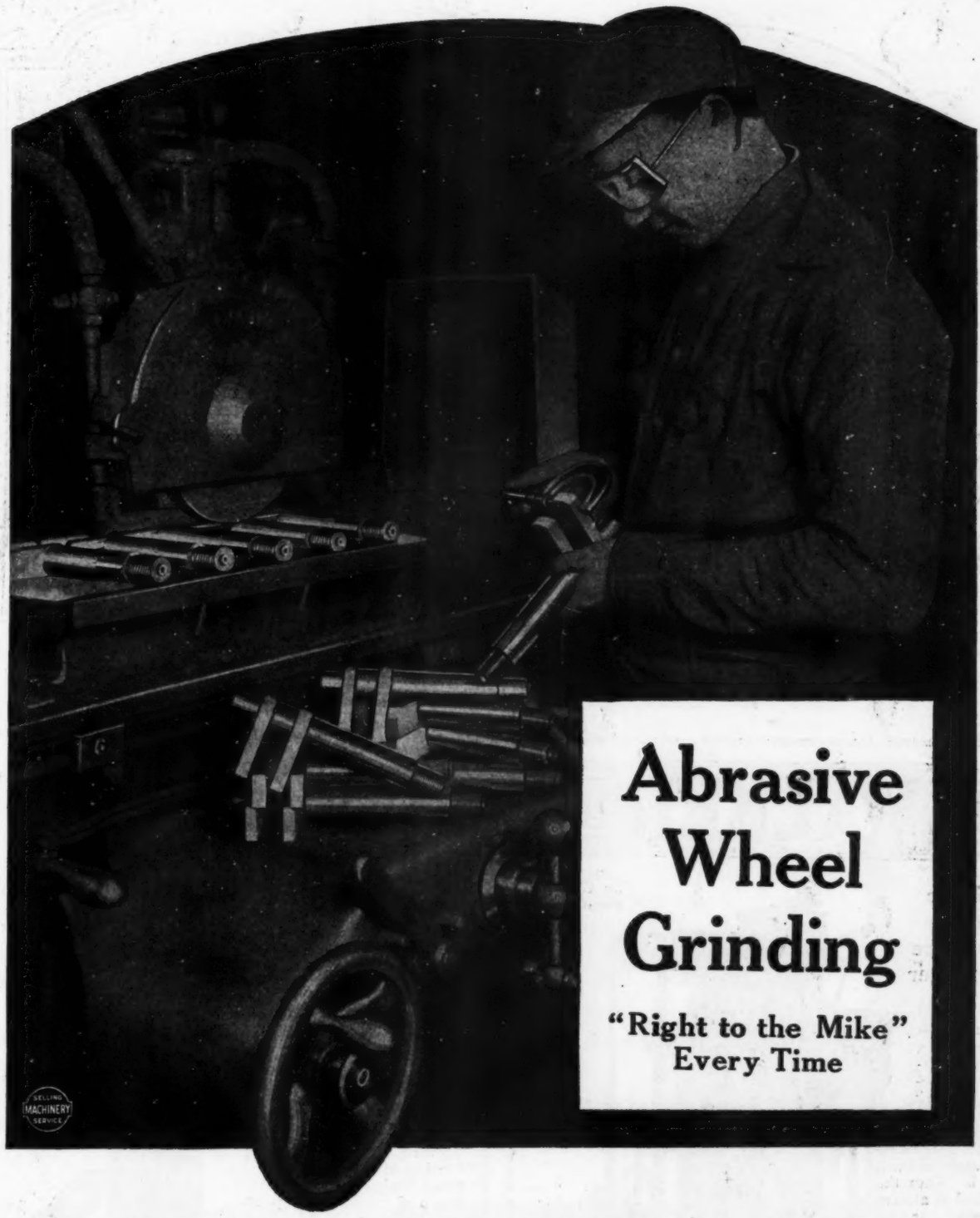
Its capacity is:—Cylindrical work 8 in. x 20 in. Surface work 6 in. x 20 in., and up to 8 in. in height.

Table travel is from 16 in. to 104 in per minute. Work rotation from 130 to 660 r.p.m. Wheel speeds 2700 and 3800.

Specially designed to take care of work that differs widely in character, this grinder will prove a valuable addition to the tool making department of any large shop or in smaller shops where versatility is desirable.

The complete specifications will tell you the important part this tool will take in increasing your production and profits.

Warren F. Fraser Co.
Westboro, Mass.



Abrasive Wheel Grinding

"Right to the Mike" Every Time

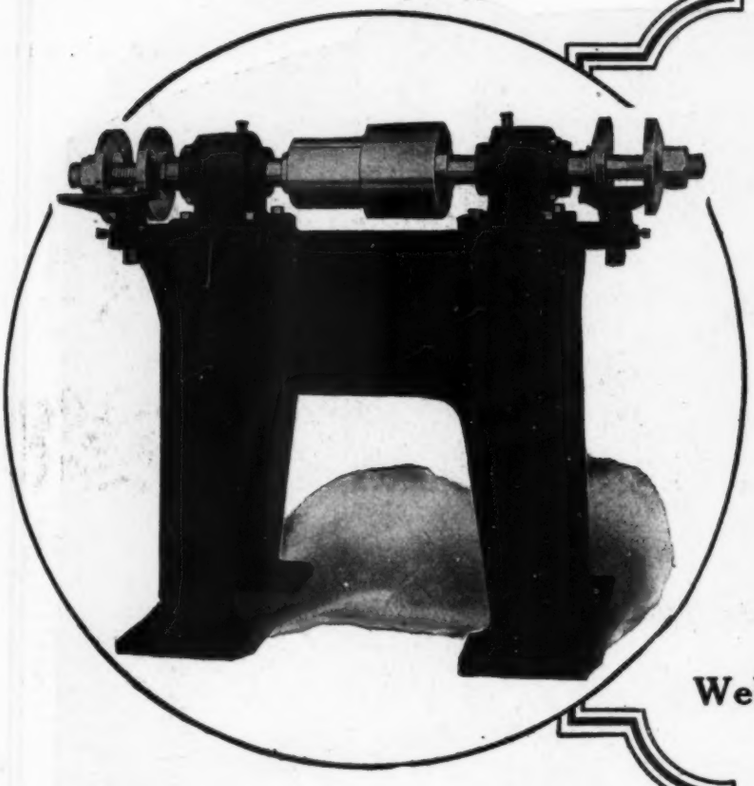
Close accuracy is essential in grinding these rocker shafts for motor truck steering gears, the allowance being only 0.001 in. under size and nothing over size. The material is 3½ per cent nickel steel; the ground surface is ⅝ in. wide by 3 in. long; stock removed 0.025 in.; five shafts are ground simultaneously. The "Abrasive" Wheel is made of "Boro-Carbone"; size 12 x 1 x 1⅛ in.; speed 1600 r.p.m.; production is 15 shafts between each truing of the wheel; output is 150 shafts per day; accuracy is actually closer than the 0.001 in. limit.

A large gear and machine company in Indiana uses "Abrasive" Wheels in this work—*and you can get similar good results when you use them.* Why not investigate?

Abrasive Company

Chicago Store: 566 W. Washington Blvd.

Main Offfice and Works: BRIDESBURG, PHILADELPHIA



For Power Conservation W&P Ball Bearing Grinding Machines

Will reduce your power expense by one-third over the best type of plain bearing machines—an important item for you to consider.

The bearings employed—Double Row Combined Radial and Thrust type—are of highest grade American make and fully guaranteed.

Our Bulletin No. 8 gives further details—send for it today.

Webster & Perks Tool Co.
Springfield, Ohio
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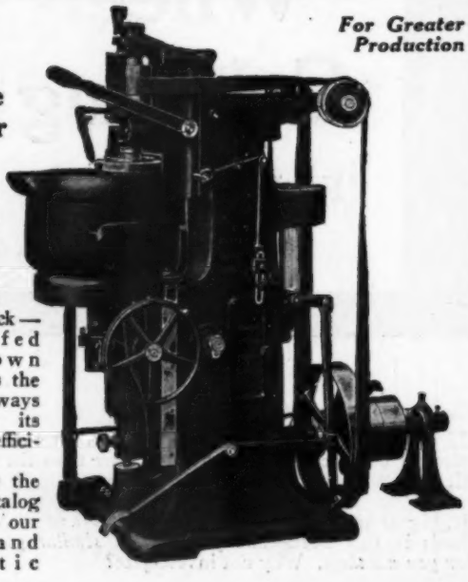
THE WALKER LINE

Single Stroke Surface Grinder

For Greater Production



Does not require a reciprocating movement. Work is held on rotary chuck—wheel is fed straight down to it. Thus the wheel is always cutting at its highest efficiency.
Ask us for the Walker Catalog describing our Grinders and Magnetic Chucks.

O·S·Walker Co
Worcester · Mass ·
Successors to O·S·Walker & Co· Walker-Grinder Co.

PRODUCTION

SURFACE GRINDER

Adjustable Taper Spindle
All Surfaces Hand Scraped
Graduated Feeds

Surface of Platen 15 x 5 in.
Traverse Movement 8 in.
Vertical Movement 9 in.
Stone 6 x ½ x ½ in.
Speed of c/shaft 400 r. p. m.
Weight 435 lbs.

$175.00

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NEW JERSEY MACHINERY EXCHANGE
NEWARK, NEW JERSEY

SUPPOSE you were studying the specifications for a big job—one that called for making new and expensive tools—would your present tool-room equipment let you handle it? There are only two kinds of tools—the good and the poor—there's no half-way mark. And the quality of your output is fixed by the degree of accuracy you can obtain in your tool-room.

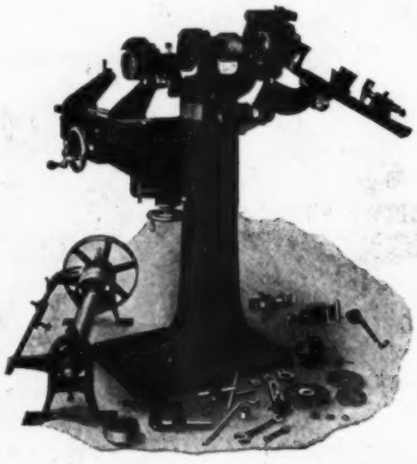
Accuracy in grinding depends upon correct cutting speed and perfect running balance. That is why the **DUMORE** grinder has been given speeds ranging from 10,000 to 50,000 R. P. M., along with a dynamically balanced armature. With this tool in your shops you can eliminate chatter, taper or bell-mouthed grinding. Then, too the **DUMORE** is portable, easily carried to all parts of the shop and quickly set up in any machine ready for use.

If you are interested in obtaining only the best tools, ask your dealer about the **DUMORE** grinder. If he doesn't carry it, write us for literature and prices.

WISCONSIN ELECTRIC CO.

2706 16th St. **RACINE, WIS.**

DUMORE

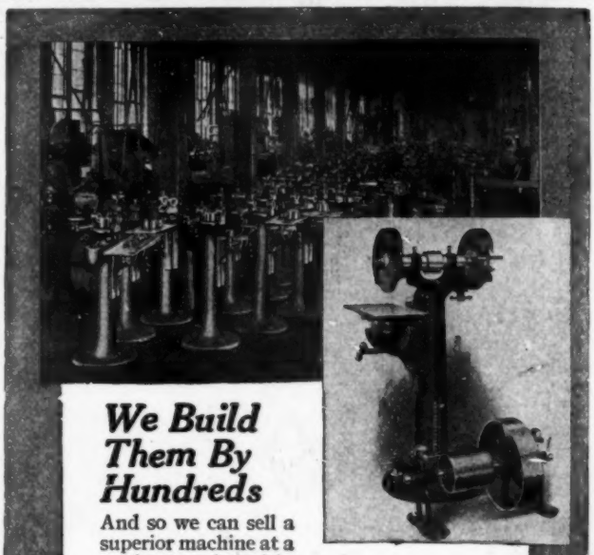


The Grand Rapids No. 2

The most truly UNIVERSAL of any grinding machine made. It will grind every shape any other machine will handle and a lot beside.

Copiously illustrated circular free.

Grand Rapids Grinding Machine Co.
33 Ottawa Avenue, N. W.
Grand Rapids, Michigan, U. S. A.



We Build Them By Hundreds

And so we can sell a superior machine at a moderate price without sacrificing any of the advantages of the more costly machines.

THE WATERBURY GRINDER
grinds rapidly and accurately, all flat surfaces, dies, punches, planer, lathe and other tools. Has adjustable table and tool rest with large radius of travel. Rigid, 3-point table supports giving great steadiness. A reliable, practical grinding outfit.

The Blake & Johnson Co., Waterbury, Conn.

A Grinder That Adds Life to Your Tools

High production is hard on tools, but *good* grinding conserves their life and value.

This Safety Grinder grinds quickly and correctly, while the easily regulated water flow prevents burning.

Send for new Catalog.

SAFETY EMERY WHEEL CO.
Larch Street, Springfield, O.

CAPITAL Internal Grinder

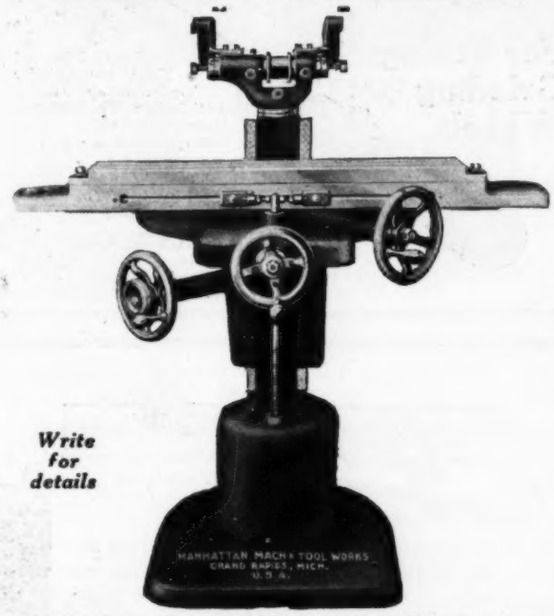
The Nearly Automatic hand-operated grinder. It is equipped with labor-saving devices—reducing lost time to a minimum—and leaving the production possible entirely up to the alertness of the operator.

For small, accurate work the "Capital" has no equal.

Write today for further information

Lansing Stamping & Tool Co.
Lansing, Mich.

An All-Around Universal Tool Grinder



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Built for the modern machine shop where there is a large variety of grinding to be done.

Capable of handling cylindrical or internal grinding with speed and accuracy. Complete equipment.

Manhattan Machine & Tool Company
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Your Tool Room Grinders Set the Pace for Your Shop

STERLING

The Speed and Accuracy of the

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Insures Maximum Grinding Efficiency in the all-important Tool Department.

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Machine Tool Department
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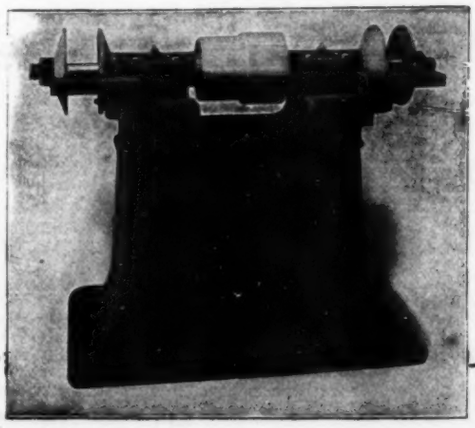

This Blount Grinder Can Handle the Heaviest Work

Designed for heavy, hard service. It does the rough drudgery. Bearings are self-oiling, babbitted and line reamed. Liners are placed between caps and boxes to prevent dust entering the bearings; also allow adjustment for wear. For wheels 30 in. x 4 in. x 2 in.

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Diamond Wet Tool Grinders

The popularity of these machines in the leading machine shop is due to sturdy construction and a design that meets approval of every operator, because he gets "a straight edge every time."

Our 16-Page Bulletin tells all about them.

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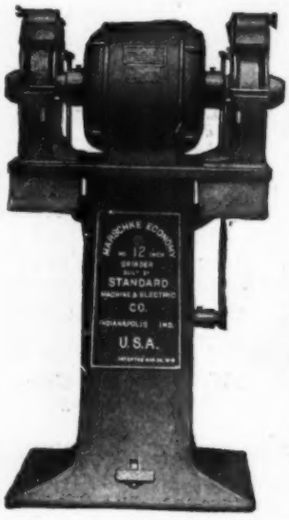
It Has the Speed

The Marschke Economy Motor-Driven Grinder starts quickly and stops instantaneously, by means of the automatic pedal starter. Think of the economy in time this will effect over a year's period!



No waste power, no lost motion and no delay. Just plain, unadulterated mechanical value.

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Marschke Mfg. Co.
Successor to
STANDARD MACHINE & ELECTRIC CO.
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For Truing Grinding Wheels

Francis Diamond Hand and Grinder Tools always give entire satisfaction. The diamonds in these tools are of the hardest and best quality and set very securely.

Length of Hand Tool shown here, 11½ in. over all. Rosewood handle. Let us send you an assortment for selection.

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Established in 1799.
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Greenfield
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A universal grinder. A grinder with all attachments. A grinder that will handle all kinds of tool-sharpening as well as cylindrical, internal and surface grinding.

An all-arcund machine for your tool-room.

Catalog No. 6.

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Greenfield. Mass., U. S. A.

Swivel Head— NOT Swivel Knee

The Woods No. 2 Universal Tool and Cutter Grinder shown here has many other admirable features, such as: Wide range, large bearings, convenient adjustments, heavy design and rigid construction.

Working parts are protected from dust, and adjustable for taking up wear. Made in three sizes—the No. 2½ with Automatic Longitude and Cross Feed.

Write for complete information on Universal Tool and Cutter Grinders.

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Try the

Diamo-Carbo Dresser

It has been used successfully for ten years. Get our bulletin and trial offer.

Desmond-Stephan Mfg. Company
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Manufacturers of Diamo-Carbo, Magazine, Sherman and Huntington Emery Wheel Dressers.

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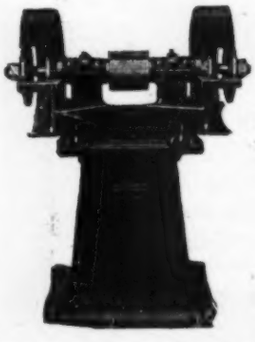

In sizes from 10 to 20-in. wheel capacity. Large chain oilers, Graphite Bearings.

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"It's a Wonder"

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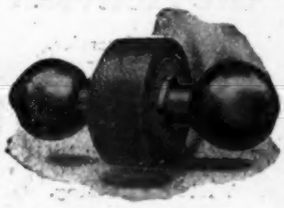

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Plant operators order from 1 to 60 at a time.

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A Wheel For Every Purpose

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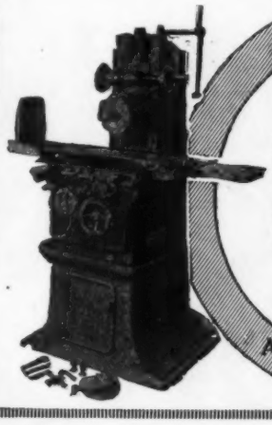
Springfield, Mass.



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The demands of war have been hard. The demands of peace will be equally so, but no matter how hard they may be this grinder is capable of handling them successfully. It is built for the most unusual work and does it.

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Some customers save 80% of their cutter bills by using

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Adopted by the U. S. Government and the leading arms manufacturers

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Will grind lathe centers mechanically with scientific accuracy in fraction of time required with other methods.

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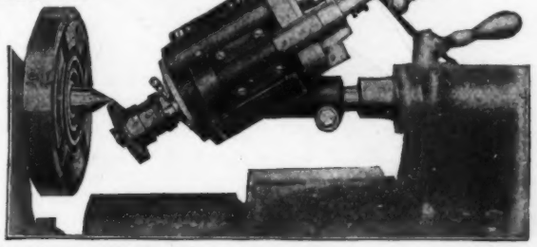

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Are No Experiment

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Plain Cylindrical Manufacturing Internals Crankshaft

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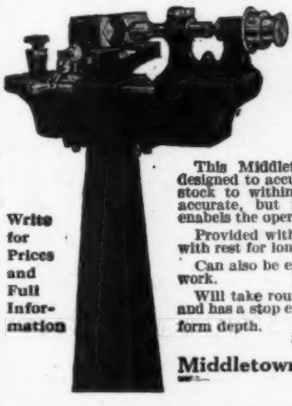

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Provided with two speeds for hard and soft stock and with rest for long pieces.

Can also be easily adjusted off the center for eccentric work.

Will take round stock from 3/16 in. to 3¼-in. diameter and has a stop enabling all work to be centered to a uniform depth.

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In a class by themselves

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WHEELS OF MAXIMUM EFFICIENCY FOR ALL GRINDING PURPOSES

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A perfectly controlled precision machine, powerful and rigid enough to take maximum roughing cuts and then finish work to extreme limits. Indispensable to manufacturers of piston rings, thrust bearings, cutters, saws and the like. **Write for catalogue.**

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Large Stocks of African, Brazilian and Carbon Diamonds. Diamond Mounting and Re-mounting in Copper, Spelter and Steel Castings.

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One Pair of these Cutters cuts every size gear from 12 teeth to a rack of same pitch. Gears run with B. & S. Involute. Regular pitches kept in stock. Special Cutters made to order.

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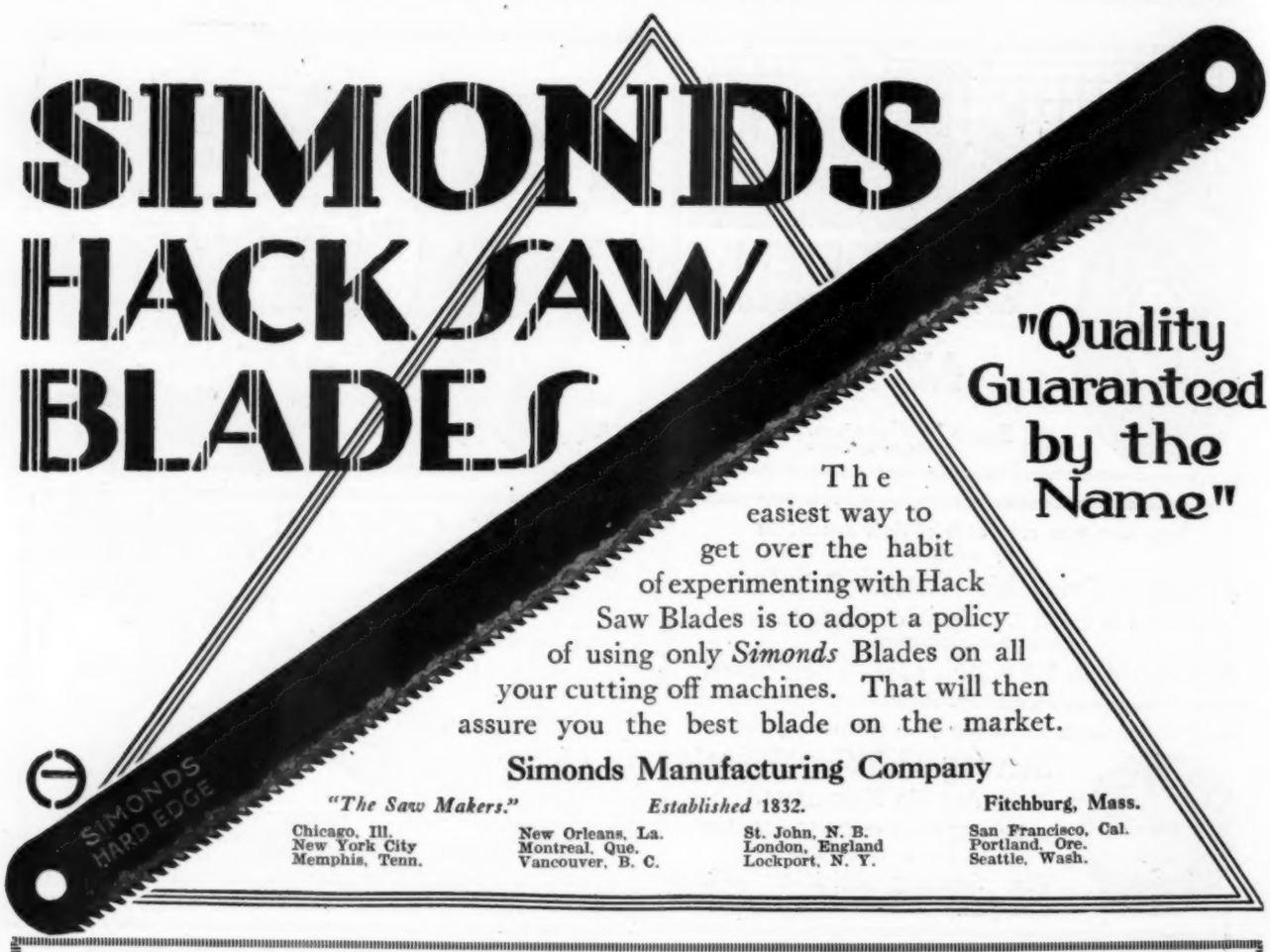
"Quality Guaranteed by the Name"



The easiest way to get over the habit of experimenting with Hack Saw Blades is to adopt a policy of using only *Simonds* Blades on all your cutting off machines. That will then assure you the best blade on the market.

Simonds Manufacturing Company

"The Saw Makers." *Established* 1832. **Fitchburg, Mass.**

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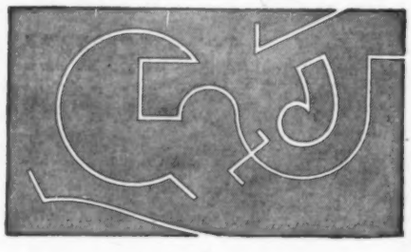
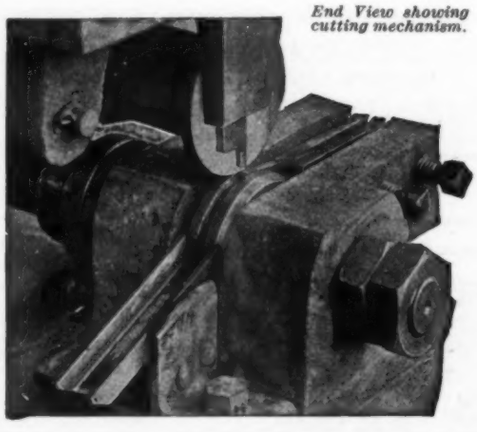


This remarkable machine will cut any conceivable shape you may want. The illustration is an example of work, showing the great variety of cuts taken.



End View showing cutting mechanism.

You Can't Stunt This Machine

Pile on the work—make it as intricate as you wish —demand any shape you can think of; you can't stunt

GRAY'S
Sheet Metal Cutter No. 1
(Patented)

It will save 75% of your labor. You will also use this same machine, with same proportionate saving on such work as ENGINE LINERS, LAGGING PLATES, GEAR COVERS and FORMING and SNAP GAUGES.

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Napier Quality Hack-Saw Blades Stand the Heavy Strain of Top-Notch Speed

Because they are hardened by the Napier patented process; that is one important selling point definitely established.

They cut accurately because they are milled for accuracy, which precludes any chance of inaccuracy.

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Napier Quality Hack-Saw Blades do this.

Write Us About

"Napier" Quality Hack Saws (Tungsten Steel)
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Napier Products { *Band-Saw Machines* / *Band Saws* / *Hack-Saw Machines* / *Hack Saws*

NAPIER SAW WORKS, Inc.,
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18

Is Your Shop-Work Marching Or Is It Merely Marking Time?

Use Racine H. S. Tungsten Power Blades

RACINE

High Speed Metal Cutting Machines eat through metal in double time and in sure accuracy

Our patented automatic lifting device raises the blade on the non-cutting stroke, thus prolonging the cutting life of the blade by eliminating all undue pressure and drag. Is the only metal cutter in the world that is positive in every action, and that will duplicate every cut during the entire life of the machine rapidly and accurately.

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We would like to send you further details — write us

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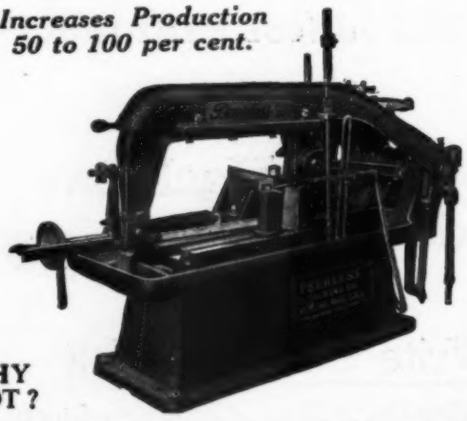
THE NEW STANDARD

Increases Production 50 to 100 per cent.



WHY NOT?

WHEN big plants of national reputation, who are using three, six, eight, twelve, and up to thirty or more Peerless Machines, say that they increase production from 50 to 100%, saving in time, labor, blades and expensive material:

AND WHEN we are willing to have you try out the Peerless for 30 days at our own risk and expense, we paying freight both ways if it fails to make good;

THEN WHY NOT try it out for yourselves, when the gain is more yours than ours if it makes good, and if it fails the loss is ours alone?

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Cutting Risers from steel castings—for there is always more or less sand to dull the saw, but "Duplex" Saws do the work and stand the strain day after day.

Hunter "Duplex" Saws owe their efficiency to the high-speed steel teeth and their easy adjustment. It is a very simple matter to obtain the correct height of teeth when assembling.

In order to get full efficiency from your Cold Sawing Machine you need Hunter "Duplex" Blades. Write for Catalog.

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CIRCULAR METAL CUTTING SAWS

ATKINS ALWAYS AHEAD
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There are no Metal Cutting Saws in the world "as good as Atkins." There are none so scientifically constructed, nor are there others which are made of steel so well adapted to the cutting of different kinds of metal.

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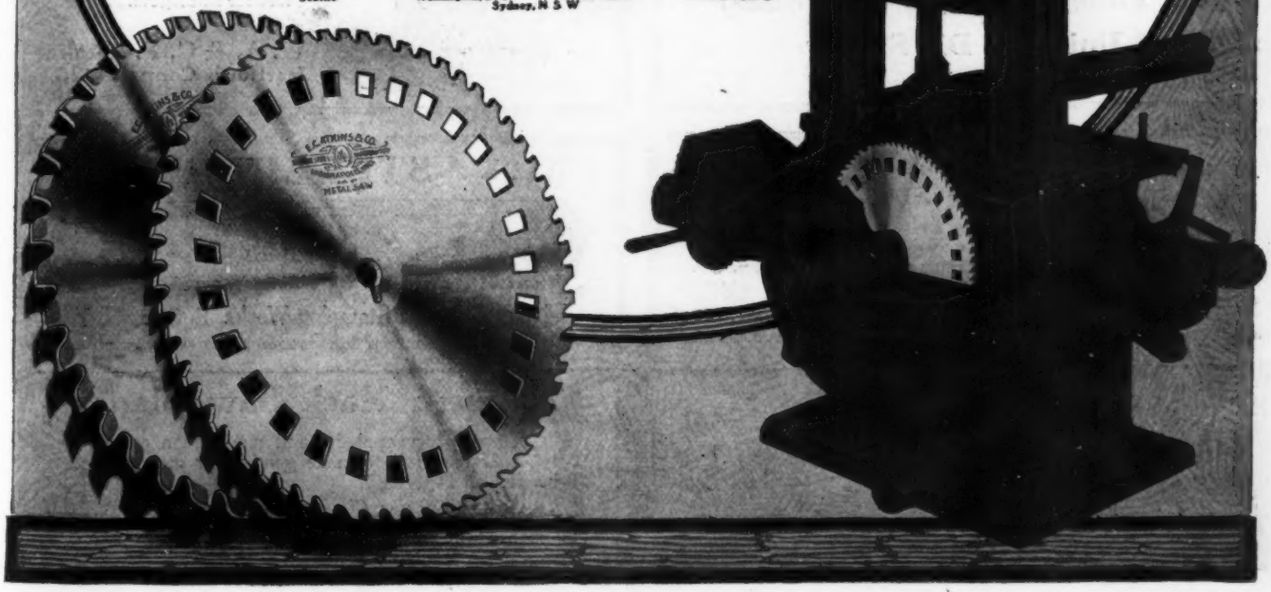
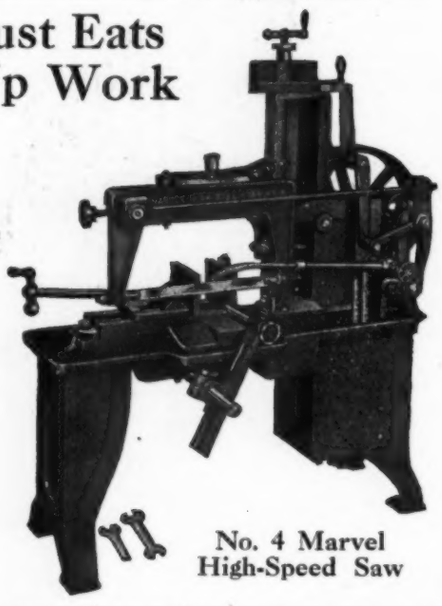


Just Eats Up Work



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Has tremendous cutting speed, turns out accurate work and will stand hard usage. This machine has been developed to highest point of efficiency. Capacity 6 x 6 in.

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Why take chances on deferred deliveries when we can give you immediate deliveries of Screw Slotting Saws from stock? Our saws, equally with our other products, have earned fair fame in the strenuous test of every-day work. They'll prove eminently satisfactory for you. And remember. "Immediate Delivery from Stock."

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Nos. 3 and 4

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Tungsten Hack Saw Blades

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Swaging Machine

Swaging is the way to reduce or point rods and tubes. Many of the "special" methods of production of well-known products consist of some form of swaging. Get details of the Dayton Swaging Machine and have definite facts about your own proposition.

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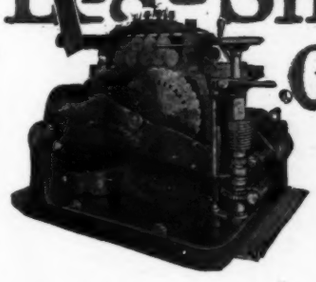

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To secure 100% Economy and 100% Efficiency, use W. N. Best oil and tar burners and furnaces for Annealing, Case Hardening, Tempering, Forging, Heat Treating, etc. Send for Catalog.

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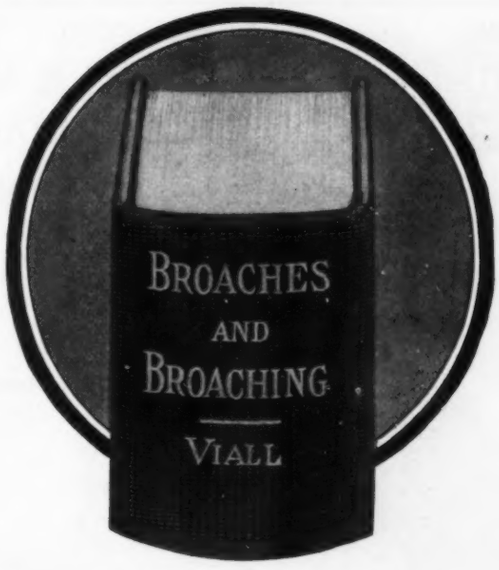

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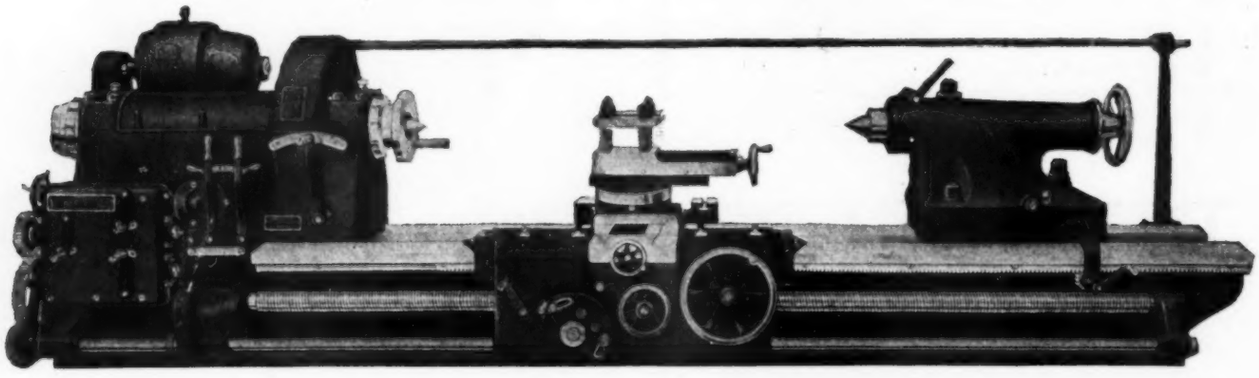

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SIZE: SWING, 46½ in., 9 ft. 10 in. BETWEEN CENTERS

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To the Lathe Buyer Who Wants Adaptability

The bed lengthens out to nearly twice its "closed length" and the swing is increased according to the size—very quickly and without sacrificing the rigidity or accuracy. Made in five sizes, 16/32 in. to 48/72 in. Belt or motor drive, quick change gear box, taper attachment optional.

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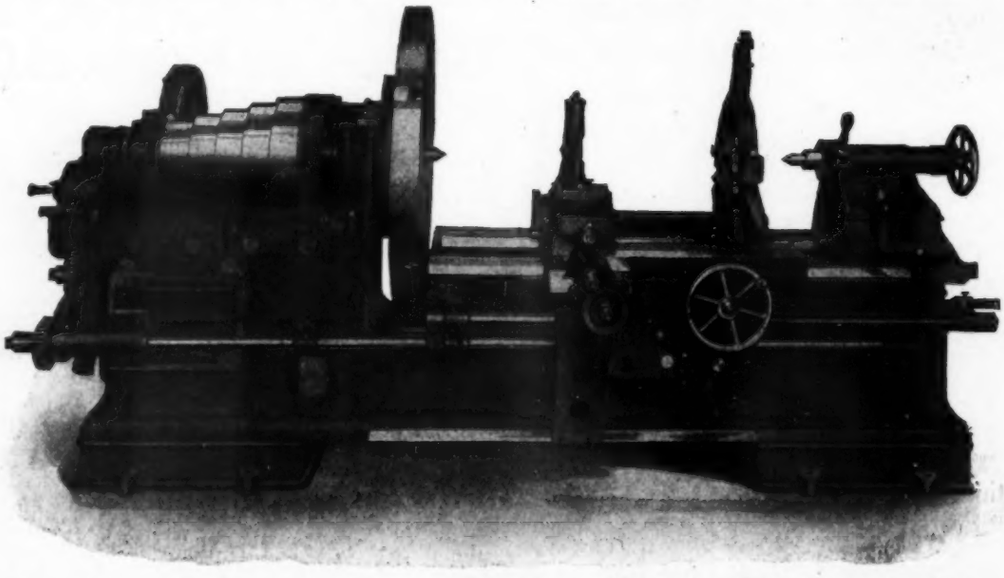

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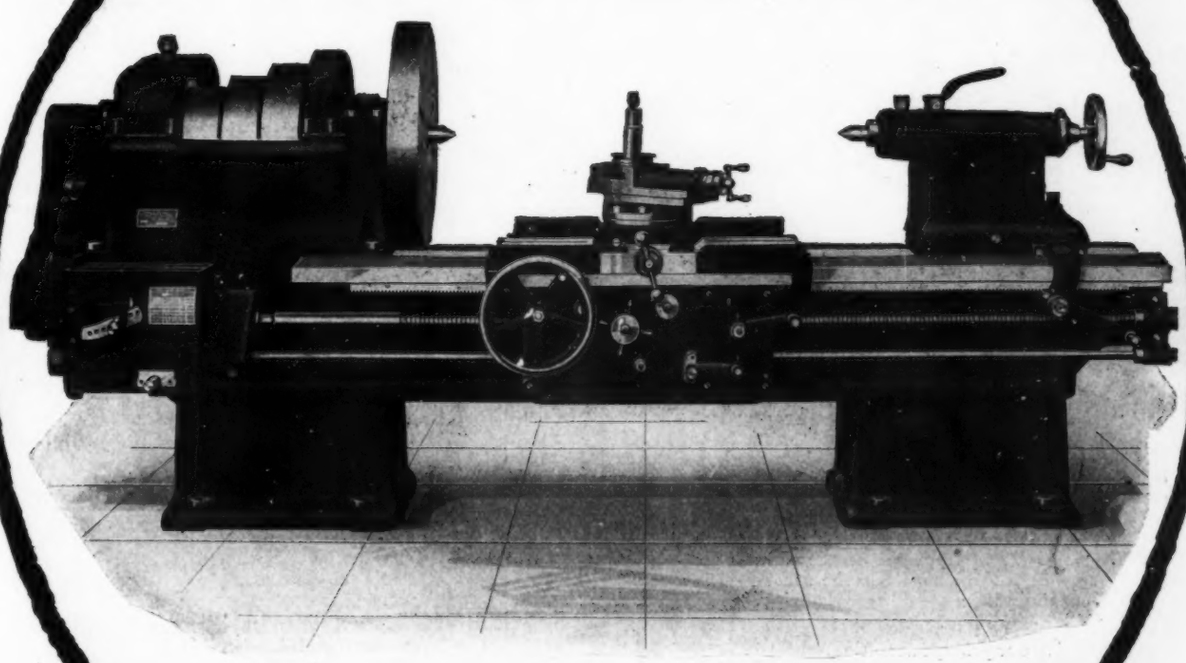
SIDNEY
Heavy Duty Lathes

For High Production Manufacture



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Write for our New Bulletin

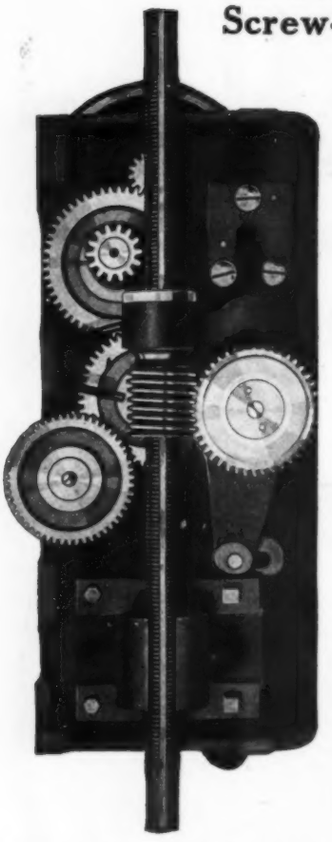
The Sidney Machine Tool Co., Sidney, Ohio, U. S. A.

AGENTS: Lynd-Farquhar Co., Boston, Mass.; J. J. McCabe Lathe & Machinery Corpn., New York City; Frank Toomey, Inc., Philadelphia, Pa.; Smith-Courtney Co., Richmond, Va.; McCoy-Brandt Machinery Co., Pittsburgh, Pa.; Simmons Machine Co., Inc., Albany, N. Y.; H. A. Smith Machinery Co., Syracuse, N. Y.; Homer Strong, Inc., Rochester, N. Y.; Strong, Carlisle & Hammond Co., Cleveland, Ohio; Vonnegut Machinery Co., Indianapolis, Ind.; The Chas. A. Strelinger Co., Detroit, Mich.; Wayne Machinery Co., Ft. Wayne, Ind.; Marshall & Huschart Machinery Co., Chicago, Ill.; Bowman-Blackman Machine Tool Co., St. Louis, Mo.; Young & Vann Supply Co., Birmingham, Ala.; Oliver H. Van Horn Co., Ltd., New Orleans, La.; Herberts Machinery & Supply Co., Los Angeles, Cal.; Fred Ward & Son, San Francisco, Cal.; Hendrie & Bolthoff Mfg. & Supply Co., Denver, Colo.; The Salt Lake Hardware Co., Salt Lake City, Utah; The Portland Machinery Co., Portland, Ore.; Perine Machinery Co., Seattle, Wash.; F. E. Satterlee Co., Minneapolis, Minn.; H. W. Petrie, Ltd., Toronto, Canada; Geo. F. Foss Machinery & Supply Co., Montreal, Canada

An Honest Lathe at an Honest Price

THE WORLD OVER — THE LINE THAT'S SUPERFINE

CANEDY-OTTO
Screw-Cutting Engine Lathe



In designing this lathe we have endeavored to incorporate the same features that have made other C-O Products the choice of hundreds of careful buyers all over the world, viz: Rigidity — Simplicity—Accuracy.

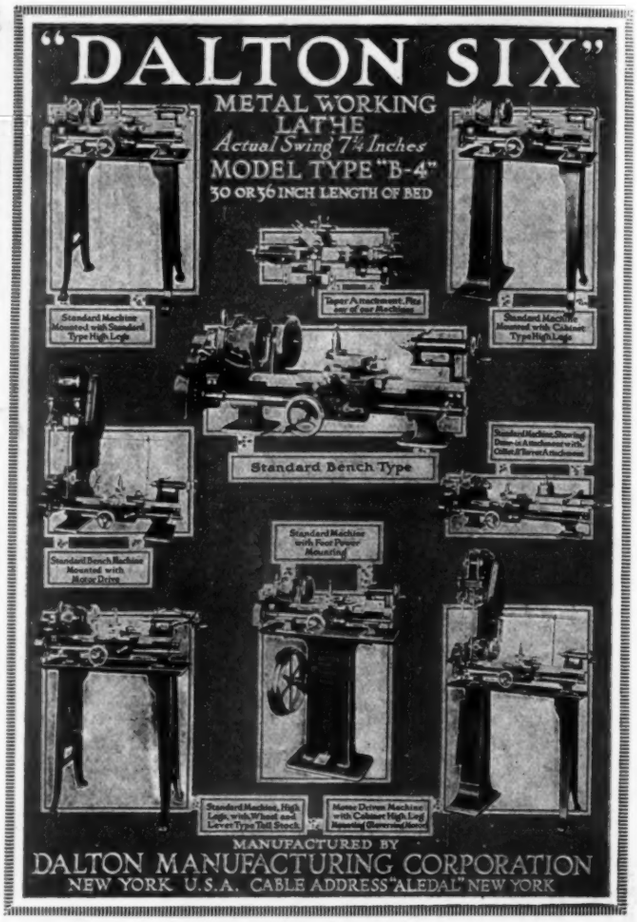
By eliminating non-essentials we are in a position to offer a lathe embracing all practical refinements at a considerable saving in first cost and consequently saving in upkeep.

We call your attention to the apron construction and mechanism. The carriage and apron of our Screw Cutting Engine Lathe are built for maximum resistance to springs and strains. Both the automatic cross and longitudinal feeds are operated from the front of the apron. It is impossible for one feed to drop while the other feed is in operation. Feed independent from screw cutting.

The details and price of this lathe will interest you—your request will receive our prompt attention.

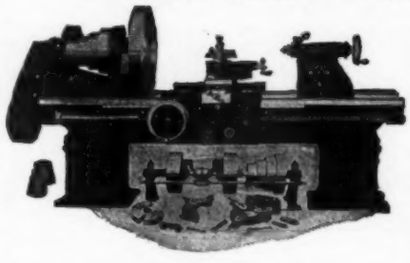
Canedy-Otto Mfg. Co.
Chicago Heights, Ill.

"DALTON SIX"
METAL WORKING LATHE
Actual Swing 7¼ Inches
MODEL TYPE "B-4"
30 OR 36 INCH LENGTH OF BED



MANUFACTURED BY
DALTON MANUFACTURING CORPORATION
NEW YORK U.S.A. CABLE ADDRESS "ALEDAL" NEW YORK

SOUTH BEND LATHES



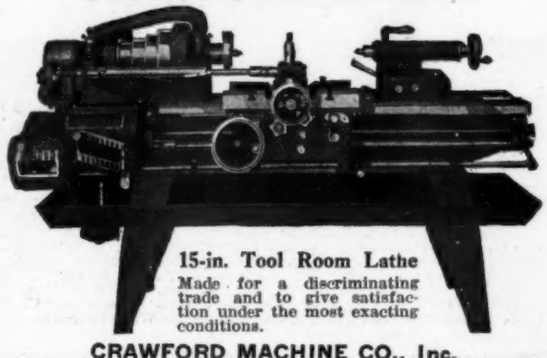
Made with straight or gap beds in 6 sizes, 13 in. to 24 in. swing, and from 4 ft. to 16 ft. beds.

Have been on the market 12 years; over 17,000 in use.

Send for New Catalog No. 55.

South Bend Lathe Works, South Bend, Ind.
422 E. Madison Street

CRAWFORD LATHES



15-in. Tool Room Lathe
Made for a discriminating trade and to give satisfaction under the most exacting conditions.

CRAWFORD MACHINE CO., Inc.
21 Park Row, New York

3000

This Is the Number of MONARCH LATHES Built This Year

During 1917, 2350 Monarch lathes were built and shipped. During 1918 our production is on a basis of more than 3000 lathes for the year.

This means that we supply more lathes to the manufacturing plants of America than any other maker.

This large production makes possible a degree of standardization and of accuracy difficult to maintain in a small production.

It also makes possible low overhead expenses and minimum cost of materials.

That is why we can offer you the lathe you want at so low a cost.

How about helping swell the number for 1919. It is going to be a big year for the Monarch.

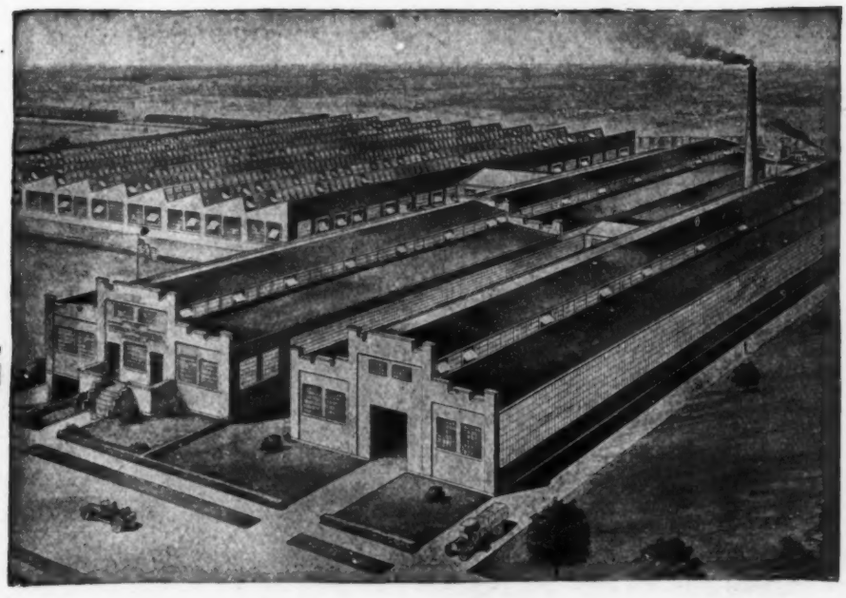
Sizes 10-, 12-, 14-, 16-, 18-, 20-, 24-, 26-, 28- and 30-in. swing.

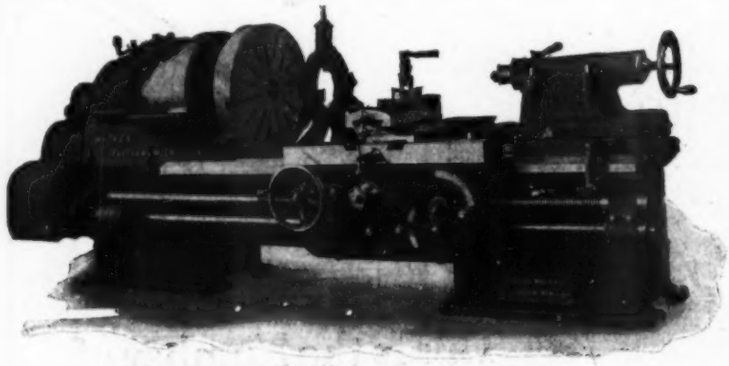
Send for catalog or consult your nearest dealer.

DOMESTIC AGENTS: Lynd-Farquhar Co., Boston, Mass. Brownell Machinery Co., Providence, R. I. Purinton & Smith Co., Hartford, Conn. Kemp Machinery Co., Baltimore, Md. Vandyck Churchill Co., New York City, N. Y. Morris Machinery Co., Newark, N. J. Syracus Supply Co., Buffalo and Rochester, N. Y. Simmons Machine Co., Albany, N. Y. Monarch Machinery Co., Philadelphia, Pa. J. S. Miller Machinery Co., Pittsburgh, Pa. W. M. Pattison Supply Co., Cleveland, O. Coughlin Machinery & Supply Co., Toledo, O. Patterson Tool & Supply Co., Dayton, O. Osborne & Sexton Machinery Co., Columbus, O. Vonnegut Machinery Co., Indianapolis, Ind. Greensboro Supply Co., Greensboro, N. C. Oliver H. Van Horn Co., New Orleans, La. Charles A. Strelinger Co., Detroit, Mich. McMullen Machinery Co., Grand Rapids, Mich. Federal Machinery Co., Chicago, Ill. Badger Packard Machinery Co., Milwaukee, Wis. Northern Machinery Co., Minneapolis, Minn. Colcord Wright Machinery & Supply Co., St. Louis, Mo. English Tool & Supply Co., Kansas City, Mo. Sunderland Machinery & Supply Co., Omaha, Neb. Hendrie & Bolthoff Mfg. & Supply Co., Denver, Colo. Salt Lake Hdwe. Co., Salt Lake City, Utah. General Machinery Co., Spokane. Hallidie Machinery Co., Seattle. Eccles & Smith Co., Portland, San Francisco and Los Angeles. Seegar-Walraven & Co., Atlanta, Ga.

The Monarch Machine Tool Co.

Sidney, Ohio, U. S. A.





32-In. Wickes Heavy Duty Engine Lathe

WICKES

Heavy Duty Engine Lathe, Built any lengths, has 3-step cone, is double back geared and has double plate apron. Built belt or motor driven.

Let us tell you about this and also our 36-in., 26-in., 20-in. and 17-in. Lathes.

Wickes Bros.
SAGINAW, MICH.

AGENTS—Wickes Bros., Seattle, Wash. Rolph Mills & Co., San Francisco, Cal. Rolph Mills & Co., Los Angeles, Cal. Machine Tool Sales Co., Pittsburgh, Pa. Badger Packard Machy. Co., Milwaukee, Wis.

Why Use an Engine Lathe for Plain Turning?

A simple, high-grade Stud Lathe can be bought for less money.

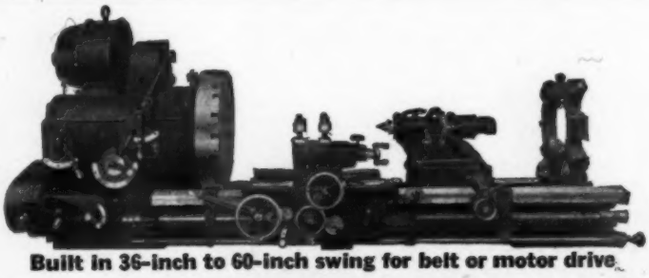
No need to pay for the extra parts. We have Stud Lathes.

For Immediate Delivery
14 in. x 6 ft.—with Compound Rest

The Lathes can be furnished with pan, pump and piping if preferred.

Get in touch with us today for full particulars.

P. PRYIBIL MACHINE COMPANY
Established 1862. New York City, U. S. A.

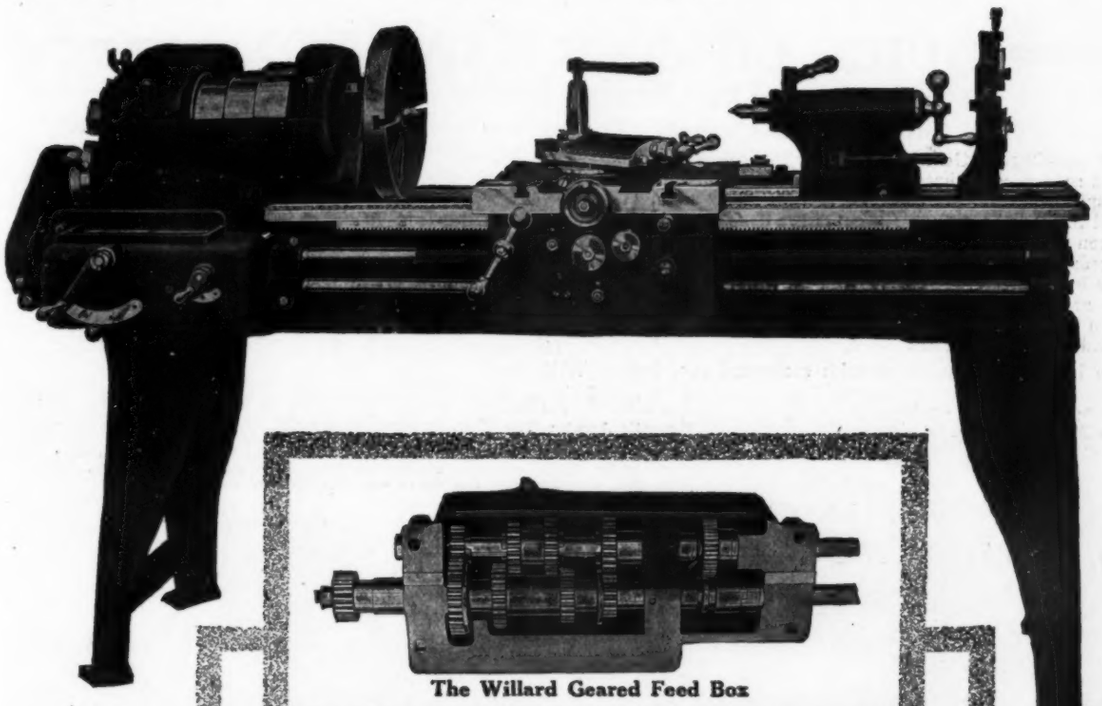


Built in 36-inch to 60-inch swing for belt or motor drive

Built by THE HOUSTON, STANWOOD & GAMBLE CO.

CINCINNATI, U. S. A.

LARGE LATHES



The Willard Geared Feed Box

WILLARD

High Power 13-in. Double Back Geared Semi-Quick Change Lathe

Has all the well-known Willard qualities — superior strength and rigidity, convenience, accuracy, high class workmanship—a machine designed to adapt itself to a varied line of work and push production to maximum limits.

Headstock is of new design—insuring extreme stiffness under any working conditions. Tailstock is of extremely rigid design — clamped to bed by a single bolt.

The chilled bed is of exceptional strength and rigidity — being extra wide and deep.

The carriage is 7½ in. wide across the bed—affording unusually stiff foundation for tool.

Why purchase a quick change lathe for manufacturing purposes and increase your overhead expense when a less expensive semi-quick change manufacturing box will give you fully the same results and even more? For manufacturing purposes you want the new semi-quick change Willard high power lathe, positive drive and all steel geared. Four regular changes available in the box and an unlimited number of others by changing the change gears in the rear. You can always get just the feed you need for proper production.

Bulletin gives details—be sure to write for it.

The Willard Machine Tool Company, Cincinnati, Ohio

QUICK CHANGE GEAR BOX

The Quality Lathe

Another super-quality feature of the Chard exposed.

The Quick-Change Gear Box is of very simple construction and so arranged that top can be removed for oiling and inspection. All shafts are of large diameters and mounted in large bearings. All gears are drop forged of .30 carbon steel. Will cut threads from 1 to 16 threads per inch, feeds from .014 to .222 inch. This is easily obtained by three levers. Arrangements are made so that additional pitches of threads can be cut by the compounding of gears on the reverse plate. This plate also reverses for right and left-hand threads.

Lathe is regularly furnished with compound rest, but can be fitted with plain rest, compound turret tool block, plain swivel rest or double tool blocks.

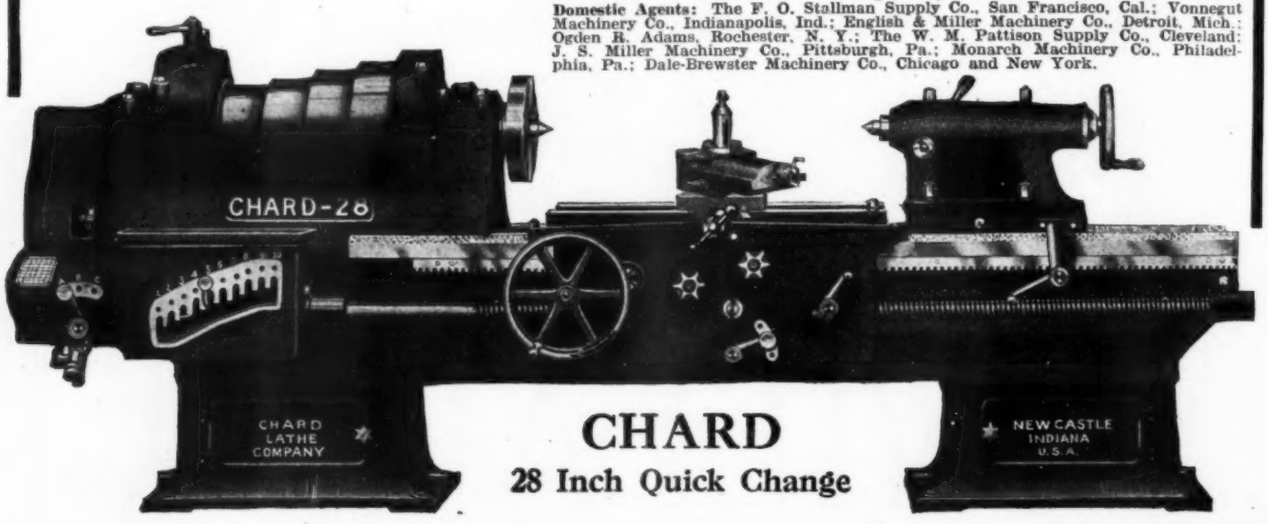
Lathe can be equipped with taper attachment, pump, pan and tubing, also follow rest when required.

Chard Lathes are made in 16-in., 18-in. and 20-in., 3-step cone, double back gear, semi-quick and quick change. 24-in. and 28-in., 4-step cone, double back gear, quick change only. Also 16-in. manufacturing for most rapid production on duplicate parts.

The complete details are available for the asking. Will you?

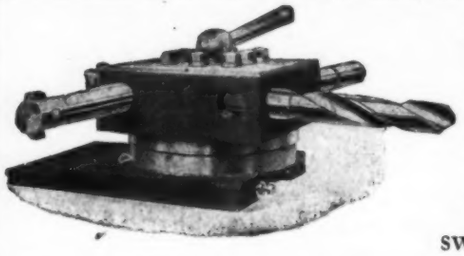
Chard Lathe Company, Newcastle, Ind.

Domestic Agents: The F. O. Stallman Supply Co., San Francisco, Cal.; Vonnegut Machinery Co., Indianapolis, Ind.; English & Miller Machinery Co., Detroit, Mich.; Ogden R. Adams, Rochester, N. Y.; The W. M. Pattison Supply Co., Cleveland; J. S. Miller Machinery Co., Pittsburgh, Pa.; Monarch Machinery Co., Philadelphia, Pa.; Dale-Brewster Machinery Co., Chicago and New York.



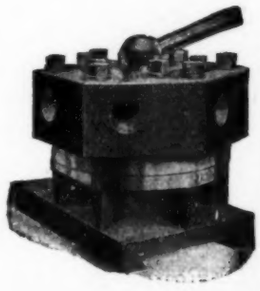
CHARD

28 Inch Quick Change



The Phoenix Will Speed Up Your Lathe Work

PHOENIX TURRET Attachments



Any size lathe, from 8 to 42-inch swing, can be made far more rapid in its output of duplicate parts, with a Phoenix Turret Attachment.

Yet the expense of equipping that lathe is but slight—the time for setting up and tooling is but a few moments.

We will be glad to tell you how other shops are making such valuable use of these attachments.

Write for illustrated catalog.

PHOENIX MANUFACTURING CO.

EAU CLAIRE, WISCONSIN

Eastern Representative:
W. L. Harrison, 913-915 Engineers Bldg., Cleveland, Ohio

Our system brings BETTER BRONZE BUSHINGS

at less cost

You wouldn't machine your own bushings if you could see how we machine them.

Because you would immediately realize that our way is more accurate in results.

And that our methods are so much quicker that we can sell bushings for less than you can make them.

Besides, our bronze alloys are more precisely uniform than those of the average foundry.

We are Bronze Bushing Specialists — that's the whole meat of the matter.

Copyright, B. B. B. Co.

Manufacturers who don't know how our service can benefit ought to find out.

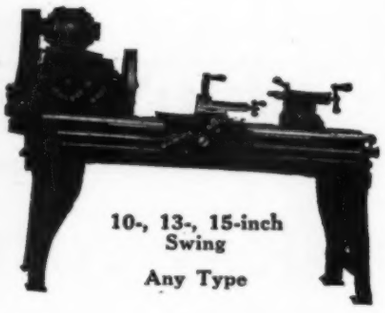
Tell us the kind and quantity of bushings you use and we will get right down to cases with you.

The Bunting Brass & Bronze Company
726 Spencer Street, Toledo, Ohio

BUNTING

Bronze Bushings and Bearings
(PATENTED)

SEBASTIAN LATHES



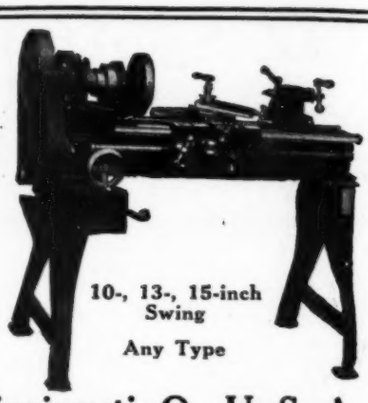
10-, 13-, 15-inch Swing

Any Type

Standard Medium Priced Lathes

for over 30 years

Write for Catalog

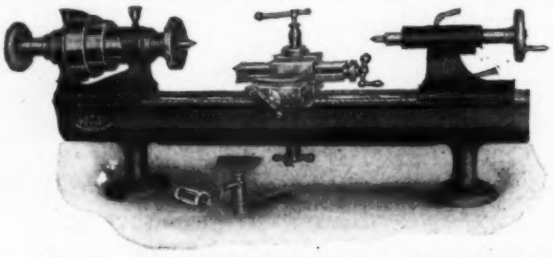


10-, 13-, 15-inch Swing

Any Type

Sebastian Lathe Company, 117 Culvert Street, Cincinnati, O., U. S. A.

Potter Precision Bench Lathe



Swing 7-in. Length of Bed 32-in. Capacity of Wire Chucks, ⅝-in. Capacity through Spindle, 1⅛-in. Diameter of Spindle Nose, 1⅝-in.—8 Threads. Distance between centers 16½. Width of Belt, 1¼-in. Taper of centers No. 3 Jarno.

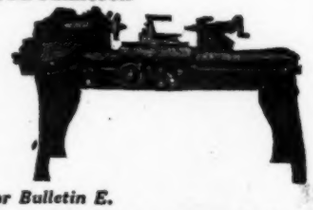
S. A. POTTER TOOL & MACHINE WORKS

75 East 130th St., New York City

A 14-in. Quick Change Gear Lathe with a swing of 15¼ inches

The Carroll-Jamieson

We call it our 14-in. Single Back Geared Lathe—really it has a swing of 15¼ in.; 32 changes of feed or thread without removing a gear. Sleeve gears are of steel running on hardened studs. All gears inclosed. Twelve spindle speeds with 3-step cone, 2½-in. belt.



Write for Bulletin E.

The Carroll-Jamieson Machine Tool Co.

Davis Avenue, Batavia, Ohio

Geo H Alexander, Birmingham, England, Agents for the British Isles exclusively.

ALLIES—The Shepard Lathe and the Satisfied User

The "New Shepard" 12 in. Cone Head Semi-Quick Change Screw Cutting Engine Lathe has many improvements not found in any other lathe. The Reversing Mechanism and Semi-Quick Change are only two of these features but they alone are well worth knowing more about.

Send for our complete descriptive Circular

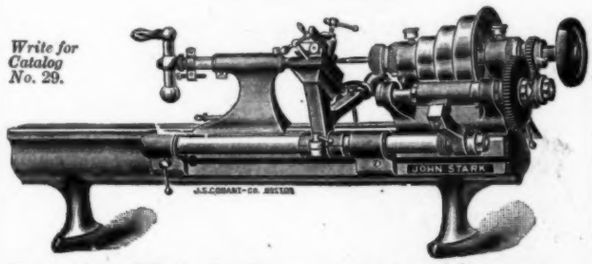
Shepard Lathe Company

Cincinnati, Ohio

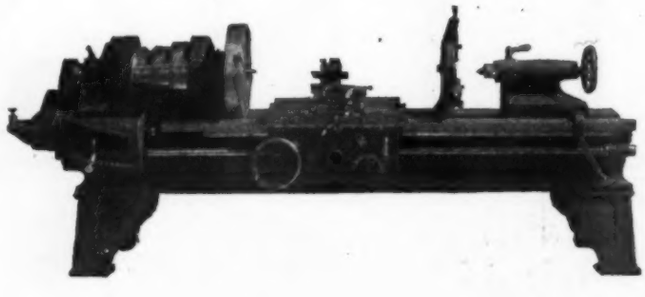
Stark Lathe Attachments

enable our famous precision bench lathes to handle an unusually wide variety of work with great accuracy, speed and facility. Ask for the full particulars.

Write for Catalog No. 29.



Stark Tool Co., Waltham, Mass.



24 in. Lathes

For Quick Delivery

Beds from 8 ft. to 20 ft. Beds

Double Back Gear

Quick Change Gear

"Built for Service"

Davenport Locomotive Works

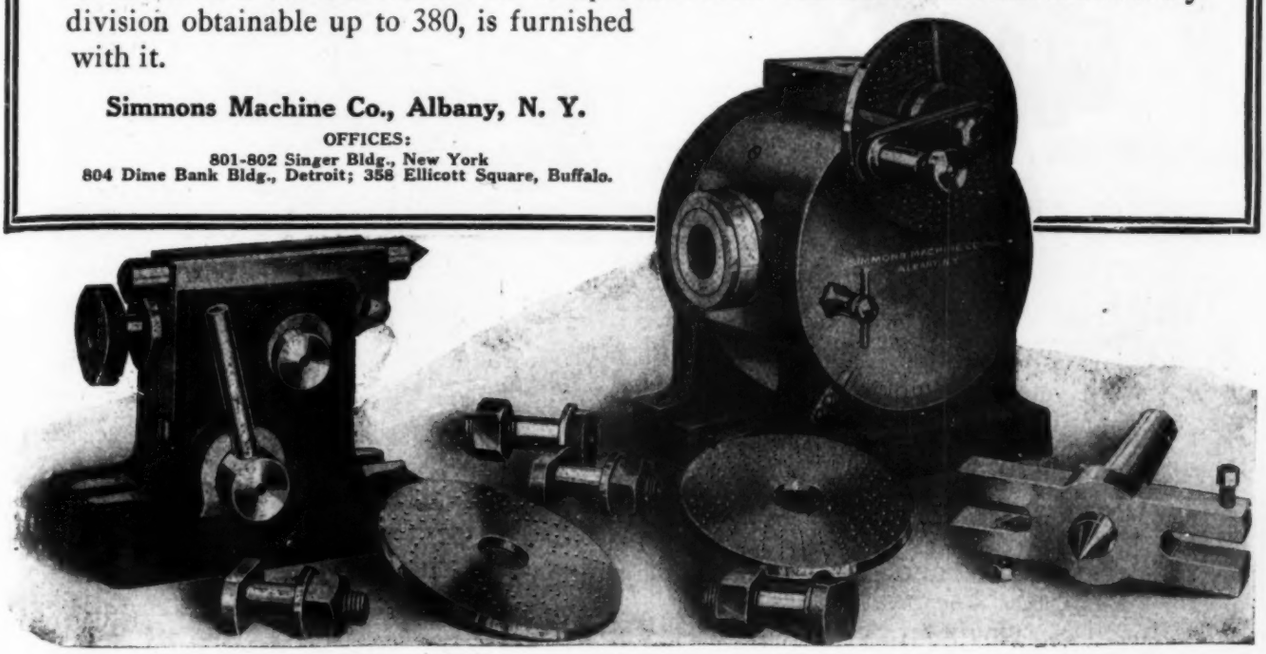
Davenport, Iowa

It's easy to attain accuracy with the SIMMONS

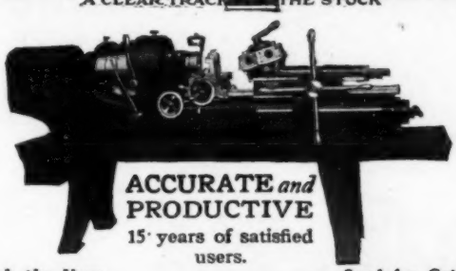
Simplicity is the cardinal feature of the Simmons Universal Index centers. Accuracies to one thousandth of an inch can be determined with comparative ease. An index chart that shows every division obtainable up to 380, is furnished with it.

Simmons Machine Co., Albany, N. Y.

OFFICES:
801-802 Singer Bldg., New York
804 Dime Bank Bldg., Detroit; 358 Ellicott Square, Buffalo.



THE TILTED TURRET
A CLEAR TRACK TO THE STOCK

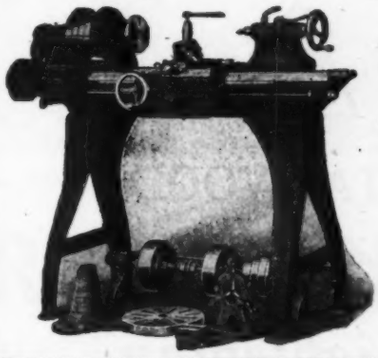


ACCURATE *and* PRODUCTIVE
15 years of satisfied users.

Ask the User *Send for Catalog*

WOOD TURRET MACHINE CO.
BRAZIL INDIANA U.S.A.

Satisfaction Not Regret



Buying a Worcester Lathe leaves no regrets because back of every one, we put our years of experience as builders of high class lathes.

We specialize on 11, 13 and 16-in. sizes and can offer you material advantages either in cone or geared head, pulley or motor drive.

Write us for full descriptive bulletins.

Worcester Lathe Co.
68 Prescott Street
Worcester, Mass.

Filsmith for Long Service

Strength of design and accuracy of workmanship. Make Filsmith your best investment.

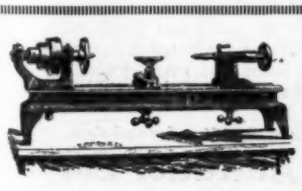
Send for Circular.

The Philip Smith Mfg. Co.
Sidney, Ohio

Libby Turret Lathe

A superior machine made by a man who is familiar with machine shop requirements. Machine is strong, powerful and rigid. Adaptable to entire range of heavy bar and chuck work. **Let us give you full details.**

International Machine Tool Co. **Indianapolis, Ind.**



It's Worth Looking Into

Here is a Speed Bench Lathe which will adapt itself to "a hundred and one" uses in your shop. It takes a full swing of 8 inches and is 20 inches between centers. There are many good features in the Oliver we want you to know. **Write for them now.**

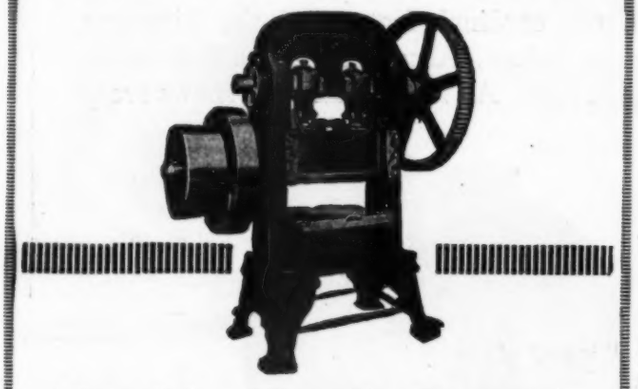
The W. W. Oliver Mfg. Co.
1480 Niagara St., Buffalo, N. Y.

CINCINNATI LATHES

Cincinnati Lathes in leading shops everywhere have convinced users as to their high efficiency and low upkeep. This means satisfactory lathe service at the lowest possible cost—in other words, true lathe economy. Ask us for complete information. Cable address: Cintilathe.

THE CINCINNATI LATHE & TOOL CO.
OAKLEY, CINCINNATI, OHIO, U. S. A.

NIAGARA



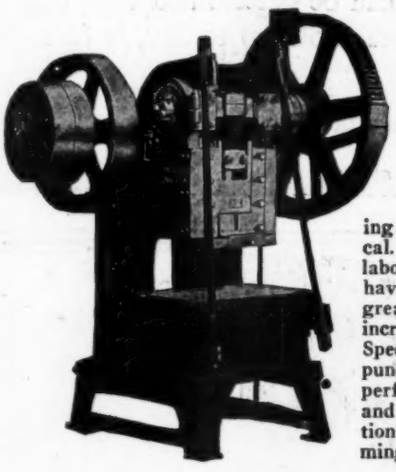
Double Crank Presses

obtain the motion of the slide by a *double crank*, which distributes the pressure upon the work. The Niagara is a strong, powerful machine with geared, straight uprights. It insures a large output at low cost. **Send for our book on presses.**

Niagara Machine and Tool Works
Buffalo, N. Y., U. S. A.
Mfrs. of Machinery for Sheet Metals.

THE "TOLEDO"

Open Back Presses



Powerful, well-balanced machines, adapted to a very broad range of work. They have a Performance record extending over a period of thirty-five years. This record is convincing to the most skeptical. Modern time and labor-saving features have been added for greater economy and increased production. Specially suited for punching, shearing, perforating, bending, and forming operations, and for trimming drop forgings.

The Toledo Machine & Tool Co.
Toledo, Ohio

OVER-SEAS REPRESENTATIVE
ALMACOA — ALLIED MACHINERY COMPANY OF AMERICA, 120 BROADWAY, NEW YORK, U.S.A. — ALMACOA

Paris, Turin, Zurich and Barcelona

Reg. U. S. Pat. Office

"METALWOOD"

Hydraulic and Hydro-Pneumatic Quick Operating Presses for

Straightening
Forcing
Broaching

Hydraulic Accumulator Systems complete; Pumps, Valves, Forged Steel High Pressure Fittings, etc.

Metalwood Manufacturing Co.
Detroit, Mich.

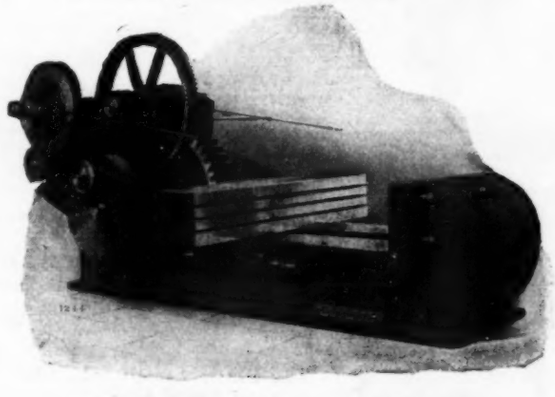
SALES REPRESENTATIVES:
R. E. Ellis Engineering Co., 621 Washington Blvd., Chicago; Fairbanks-Morse & Co., Inc., 30 Church St., New York City; Sherritt & Stoer Co., Finance Bldg., Philadelphia, Pa.; Canadian Fairbanks-Morse Co., Ltd., Montreal and Toronto.

Established 1856 Incorporated 1878

"The Quality Line"

Punching, Shearing and Forging Machines and Machinery Equipment for Shipyards, Steel Car Plants, Rolling Mills, Bridge and Structural Works.

(See new cut in Feb. 21st issue)

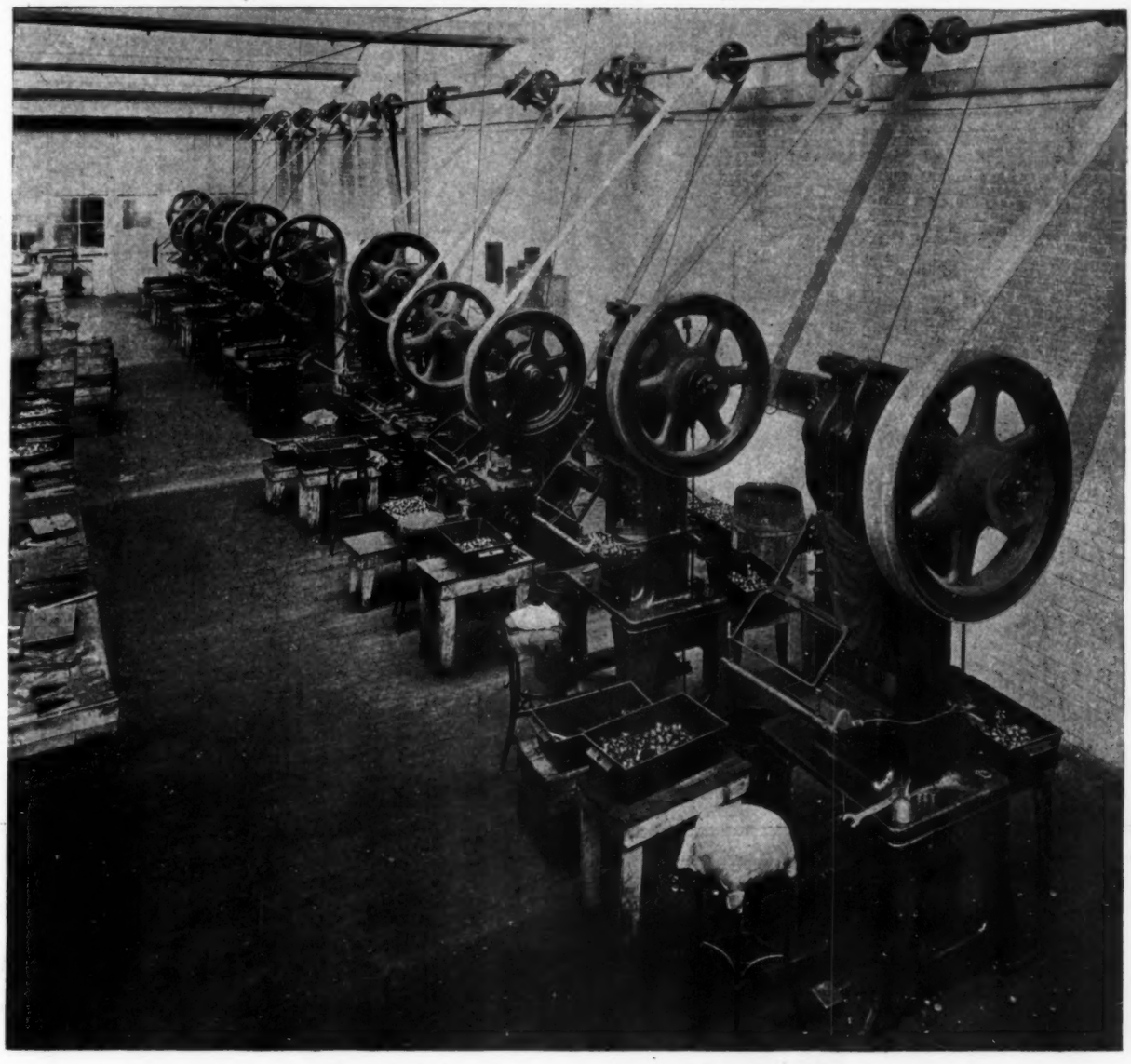


Horizontal Bending and Forming Machine

All machines are built of steel and semi-steel with hammered steel shaft and phosphor bronze bearings. Our workmen have had many years of experience in building these high-grade machines. Our aim is "QUALITY."

Our catalog will show some of the 350 styles and sizes.

The Long & Allstatter Co.
HAMILTON, OHIO, U. S. A.



Photograph by courtesy of Acklin Stamping Co.

AN ORDER FOR 39

This picture shows part of a single order for thirty-nine "BLISS" Presses of various types installed by the Acklin Stamping Company. Four other "BLISS" advertisements show other sections of this splendidly equipped, well lighted and well arranged plant.

The stamping, forming and drawing of light or heavy metals for various purposes is fully provided for in the lines of power presses we manufacture.

BLISS

E. W. BLISS COMPANY

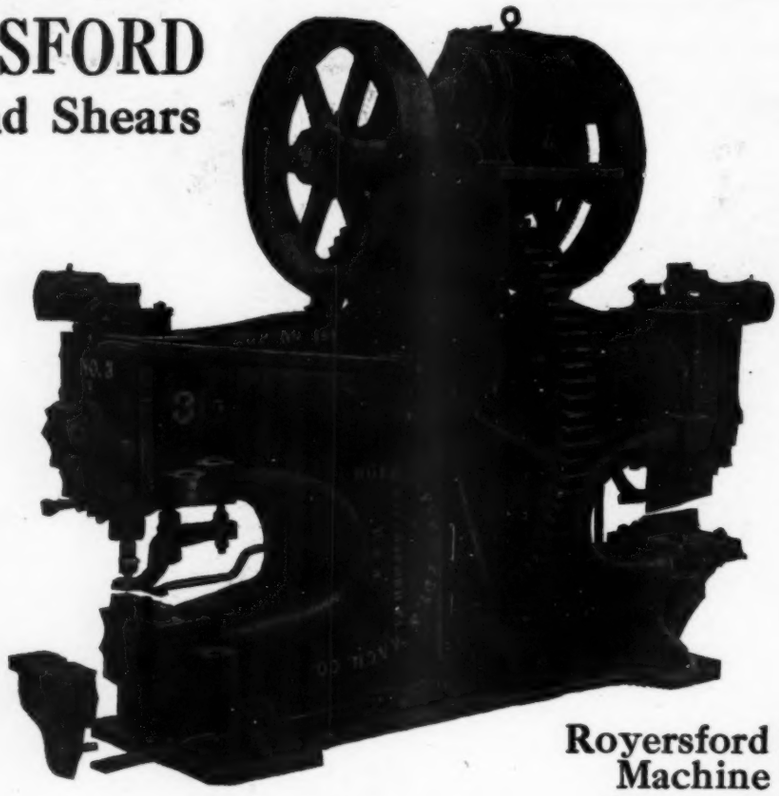
BLISS

Main Office and Works: BROOKLYN, N. Y., U. S. A.

1857 CHICAGO OFFICE Peoples Gas Bldg. DETROIT OFFICE Dime Bank Bldg. CLEVELAND OFFICE Union Bank Bldg. 1918

LONDON, S. E., ENGLAND, Pocock Street, Blackfriars Road. PARIS, FRANCE, 100 Boulevard Victor-Hugo St. Ouen.

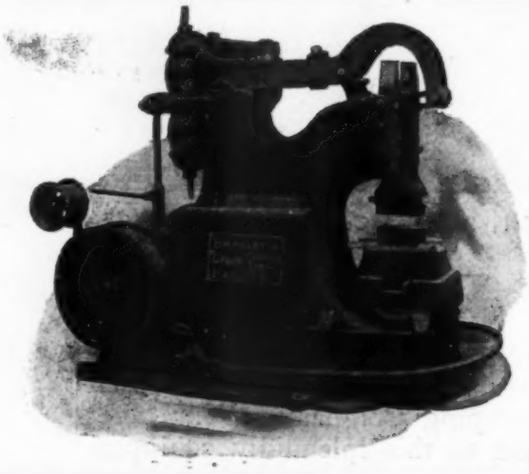
ROYERSFORD
Punch and Shears



Write for Catalog

Motor or Belt Drive

Royersford Foundry & Machine Co., Inc.
Factory: Royersford, Pa.



Forge with a BRADLEY

Many of the leading manufacturers of the country have cut their production costs by installing a Bradley Hammer.

With various formed dies you can produce parts in a few moments that would require long hours of machine work.

Our engineering department is at your service. Let us do some figuring for you.

C. C. Bradley & Son, Syracuse, N. Y.

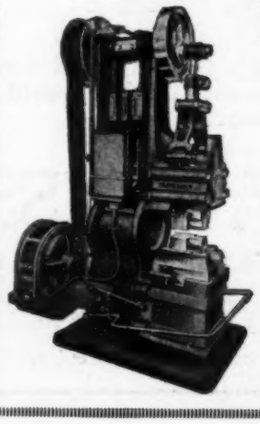
FOREIGN AGENTS: Brazil, France, Belgium, Switzerland, Spain, Portugal and Italy, Fenwick Freres & Co., Paris. England, Buck & Hickman, Whitechapel Road, London.

"ERIE" Steam Hammers

For Either Air or Steam Operation

Single Frame—Double Frame or Steam Drop Hammers.

ERIE FOUNDRY COMPANY
Erie, Penna., U. S. A.



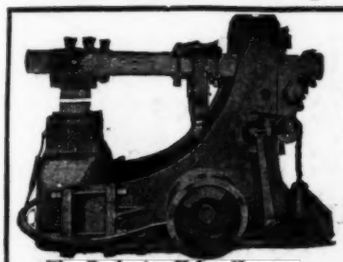
FAIRBANKS HAMMERS
—Belt or—
Motor-Driven

These hammers embody a design and workmanship that is unsurpassed.

Catalog?

United Hammer Co.
Oliver Bldg., Boston, Mass.

We Would Like You to Share in Our Opinion



The Rochester Helve Hammer

That Is

It is to your advantage to install a Rochester Helve Hammer (6 sizes—2 styles of frames) at the earliest opportunity. The Helve Hammer Book tells the whole story. Ask for it!

THE WEST TIRE SETTER CO., Rochester, N. Y.

We're on the Mark and Set — Will You Yell "Go!"

Just bid us "go" to your plant to put that broken-down engine back in service.

We'll do it, you know and in a jiffy—for we belong to the

Underwood Wrecking Crew

Making quick "getaways" is our habit. We're ready for your call any hour of the day or night—and with tools all packed.

When next a plant tie-up confronts you, don't worry—

Put it up to us.

H. B. UNDERWOOD & CO., Philadelphia, Pa.

PRESSES and SHEARS

Sheet Metal Working Machinery

THE D. H. STOLL CO., Inc.

BUFFALO. N. Y.

ATLAS Presses

There is nothing to offset the saving when you invest in an Atlas Press. You get two presses for the cost of one when you install Atlas Presses. Write for the Atlas Bulletins.

Atlas Press Co., 317 N. Park St., Kalamazoo, Mich., U. S. A.

TRAHERN ROTARY GEARED PUMPS

will keep the cutting tool under a constant flow of coolant; supply it without pulsation and with little wear on the pump. TRAHERN Pumps are simple in construction, efficient, economical, and easy to attach.

TRAHERN PUMP COMPANY

Rockford, Illinois, U. S. A.

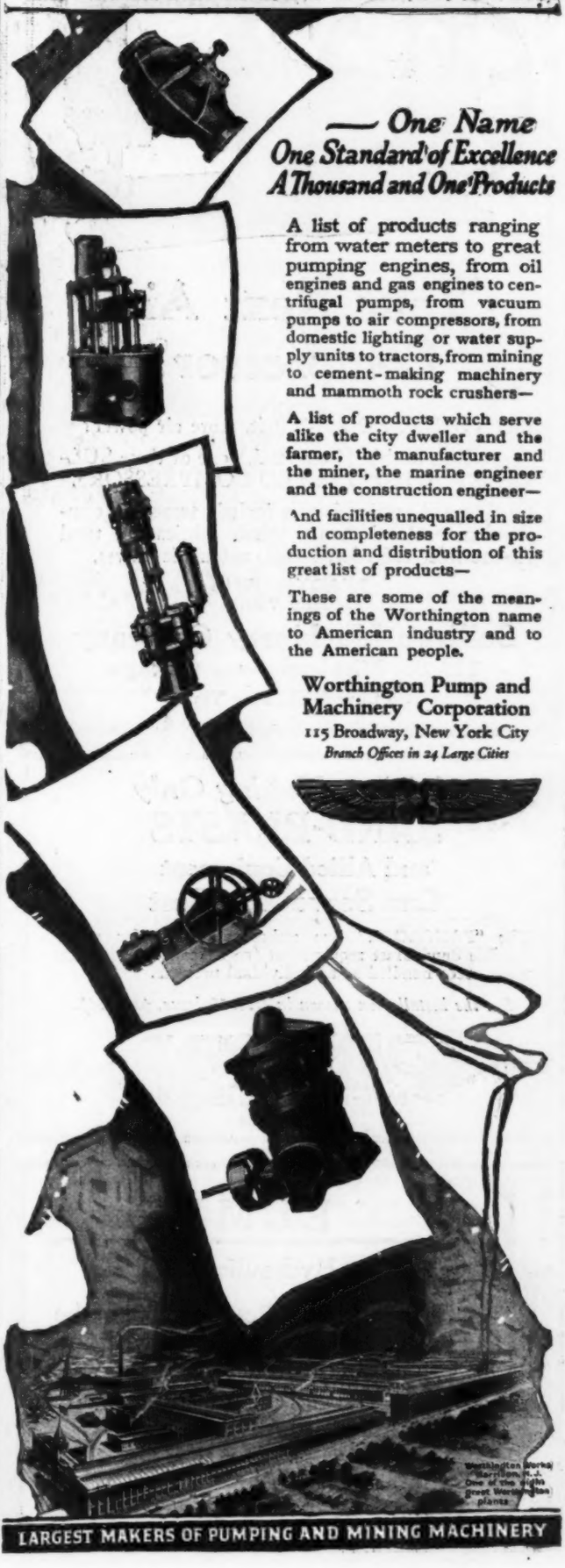
FERRACUTE PRESSES

HUNDREDS OF SIZES AND STYLES

FOR CUTTING, FORMING, PUNCHING, DRAWING AND EMBOSSING BAR AND SHEET METALS, PAPER, LEATHER ETC.

FERRACUTE MACHINE CO., BRIDGETON, N. JERSEY, U.S.A.

WORTHINGTON



— One Name
One Standard of Excellence
A Thousand and One Products

A list of products ranging from water meters to great pumping engines, from oil engines and gas engines to centrifugal pumps, from vacuum pumps to air compressors, from domestic lighting or water supply units to tractors, from mining to cement-making machinery and mammoth rock crushers—

A list of products which serve alike the city dweller and the farmer, the manufacturer and the miner, the marine engineer and the construction engineer—

And facilities unequalled in size and completeness for the production and distribution of this great list of products—

These are some of the meanings of the Worthington name to American industry and to the American people.

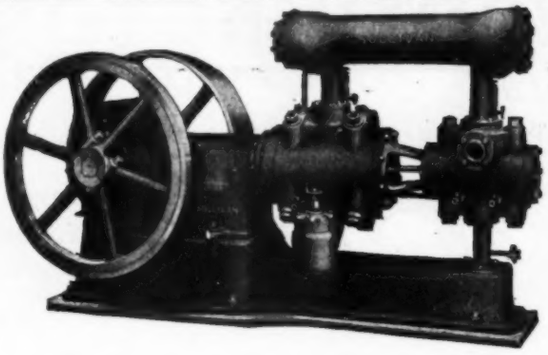
Worthington Pump and Machinery Corporation

115 Broadway, New York City

Branch Offices in 24 Large Cities

Worthington Works, Harrison, N. J. One of the eight great Worthington plants

LARGEST MAKERS OF PUMPING AND MINING MACHINERY



Your Next Air Compressor?

DO YOU NEED 250-300 ft. more air power?

Just tell us to ship (from stock) one of these SULLIVAN "WH-3" BELTED COMPRESSORS.

Quality and service factors include two-stage compression, enclosed frame, splash lubrication, total closure inlet unloader, radial, automatic valves.

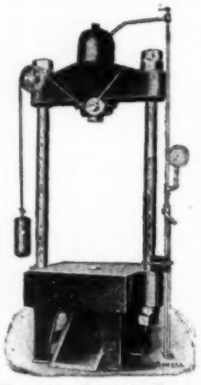
READY NOW!
Bulletin 750G

Sullivan Machinery Company
122 So. Michigan Ave., Chicago
30 Church St., New York

Richard Dudgeon

Hydraulic Jacks
Hydraulic Presses
Hydraulic Punches
Roller Tube Expanders

Broome and Columbia Sts., New York City



Hydraulic Broaching Press

For Your Pressing Needs
HYDRAULIC PRESSES AND PUMPS

Standard and Special Hydraulic Machinery. Presses for forging, forcing, bending and general machine shop requirements. Baling and Extracting Presses. A Hydraulic Press for every need. Let us help you solve your hydraulic problems. We can give you expert advice based on forty years' specializing in hydraulic high-pressure machinery.

Write for catalogs.

The Hydraulic Press Mfg. Co.
Engineer-Builders of Hydraulic Machinery exclusively
78 Lincoln Ave., Mt. Gilead, O.
Branch Offices: Room 119-N, 39-41 Cortlandt St., New York City; 427-B Guardian Bldg., Cleveland, Ohio.

A Plant Making Only
SAND-BLASTS
and Allied Equipment
Can Serve You Best

The "PANGBORN" line embraces devices for every feasible Sand-Blast requirement from smallest to largest. Your needs handled as an individual problem.

See the installation shown in Dec. 19 issue, page 161.

PANGBORN
CORPORATION
HAGERSTOWN, MD.
SAND-BLAST SPECIALISTS

P. O. Box 855

Little Giant Air Drills
WILL SPEED UP THE WORK

Long life, high power, and economical upkeep and air consumption are features of Little Giant Ball Bearing Drills, Reamers, Flue Rollers, Tappers and Wood Borers.

Send for Bulletin 127.

Chicago Pneumatic Tool Company
1022 Fisher Bldg. Chicago **52 Vanderbilt Ave., N. Y.**
Branches Everywhere A-6

ELMES
For Hydraulic Machines

from the smallest portable to the very largest made you will find our line complete.

Special designs of any capacity built to order.

Send for Catalogue

Est. 1861

Charles F. Elmes Engineering Works
1001-1013 Fulton St., Chicago, U. S. A.

HYDRAULIC TOOLS

Broaching presses, Benders, Pumps, Accumulators, Die presses, Punches, Shears, Shaft straighteners, Bolt forcers, Hydraulic fittings, etc. Write for catalogs. We build to order to meet special requirements.

WATSON-STILLMAN COMPANY
42 Church St., New York
Chicago: McCormick Bldg.

Hydraulic Machinery

Composition Moulding Presses. Hydraulic equipment for all purposes. State your requirements.

The Chas. Burroughs Co., Newark, N. J.

No. 38 "Little David" Chipping Hammer

No. 2 "Little David" Non-Reversible Drill

No. 80 "Little David" Long Stroke Riveting Hammer

No. 33SC "Little David" Reversible Drill

No. 7 "Little David" Grinder

ARE YOU SATISFIED With Your PNEUMATIC TOOLS

Are they as speedy workers as you would like?

Is their air consumption the lowest—proportionate to their power?

Are your tools as inexpensively maintained as they might be?

"Little David" Tools are described in the "Little David" Catalog.

You will want a copy—write today.

INGERSOLL-RAND COMPANY

11 Broadway New York — *Offices the World Over* — 165 Q. Victoria St. London

58-PT

Three Words—

Powerful — Efficient — Economical. They are synonymous to

The Nazel Air Hammer

Built in sizes from 75 to 850 lb.—for belt or direct motor drive. By the way, have you a copy of the Nazel Hammer Book? We think you'll enjoy reading it.

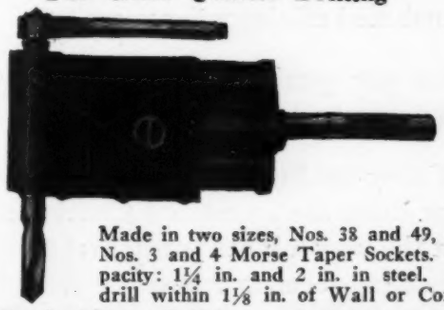
Nazel Engineering and Machine Works

4039 N. 5th St. - Philadelphia, Pa.

850-lb. Hammer Motor Driven

Cleveland Corner Drill

BALL BEARING TYPE
For Close Quarter Drilling



Made in two sizes, Nos. 38 and 49, with Nos. 3 and 4 Morse Taper Sockets. Capacity: 1¼ in. and 2 in. in steel. Can drill within 1⅛ in. of Wall or Corner.

The Cleveland Corner Drill is very simple in construction, having one-third less number of parts than any similar type of drill, and is 3½ inches shorter in over-all length. The body of drill is "one-piece" and is provided with "hand-hole" opening, permitting easy access to crank and connections. The drill sockets are made full length and will admit the entire shank of Standard Morse Taper Drill Bits, hence no strain on Tange.

Machine shipped on approval.

Bowes' Air Hose Couplings

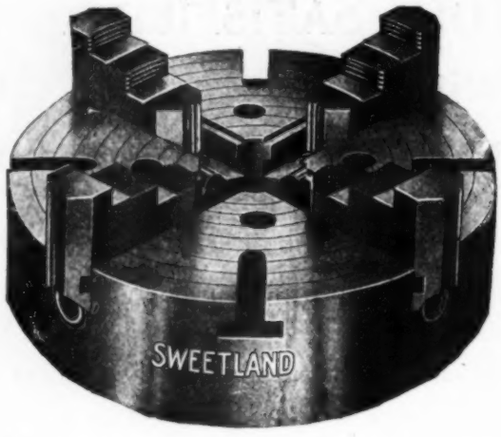
Over 1,500,000 in general use.

AIR TIGHT

Absolutely air tight under all pressures.
Above shows Cleco Never Slip Clamps attached to Bowes Couplings
Write for Catalog No. 14.

The CLEVELAND PNEUMATIC TOOL CO.

New York Chicago CLEVELAND, OHIO Philadelphia Detroit Pittsburgh San Francisco, Cal.
Cleveland Pneumatic Tool Co. of Canada, Ltd., Toronto, Ont.
John MacDonald & Co., Pollokshaws, Glasgow, Scotland



SWEETLAND CHUCKS

When you pay out your money for a chuck you are entitled to one that will do all that is claimed for it—one that will perform every chucking operation within its range and continue with unabated efficiency for years.

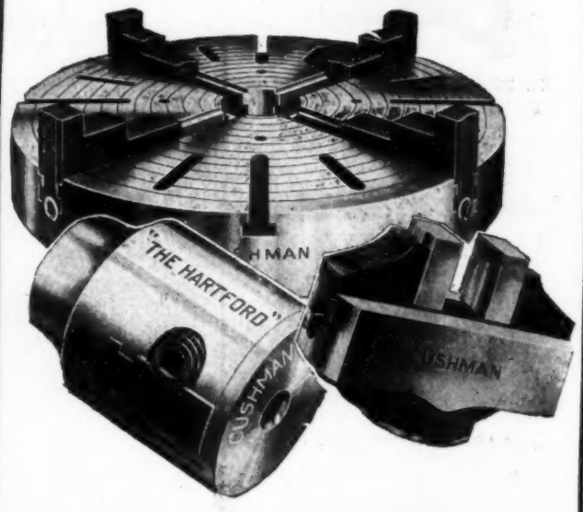
Are you getting this service with the chucks you are now using?

If they are Sweetland Chucks you are, for there are Sweetland Chucks in use at the very minute you are reading this that have been in active service for from 30 to 40 years and are as good today as ever. How about Sweetlands for you?

Send for Catalog No. 11C.

THE HOGGSON & PETTIS MANUFACTURING COMPANY

NEW HAVEN, CONN., U. S. A.



CUSHMAN CHUCKS

For 56 years Cushman Chucks have held a proud position in the machine tool industry. In all that time they have steadily kept pace with every advance in machine construction and every improvement in the process of machining has been met by these magnificent chucks, until today they are unsurpassed in strength, rigidity and ease of handling.

They are built for severest high speed steel operations—are quickly and securely adjusted—and stand the hard knocks of rush order jobs.

Cushman Chucks are made in many types and sizes and are adapted to all conditions of practical shop work.

Send for our Illustrated Catalog, describing our Complete Line of Lathe Chucks, Drill Chucks and Portable Face Plate Jaws

Cushman Chuck Company

Hartford, Conn.

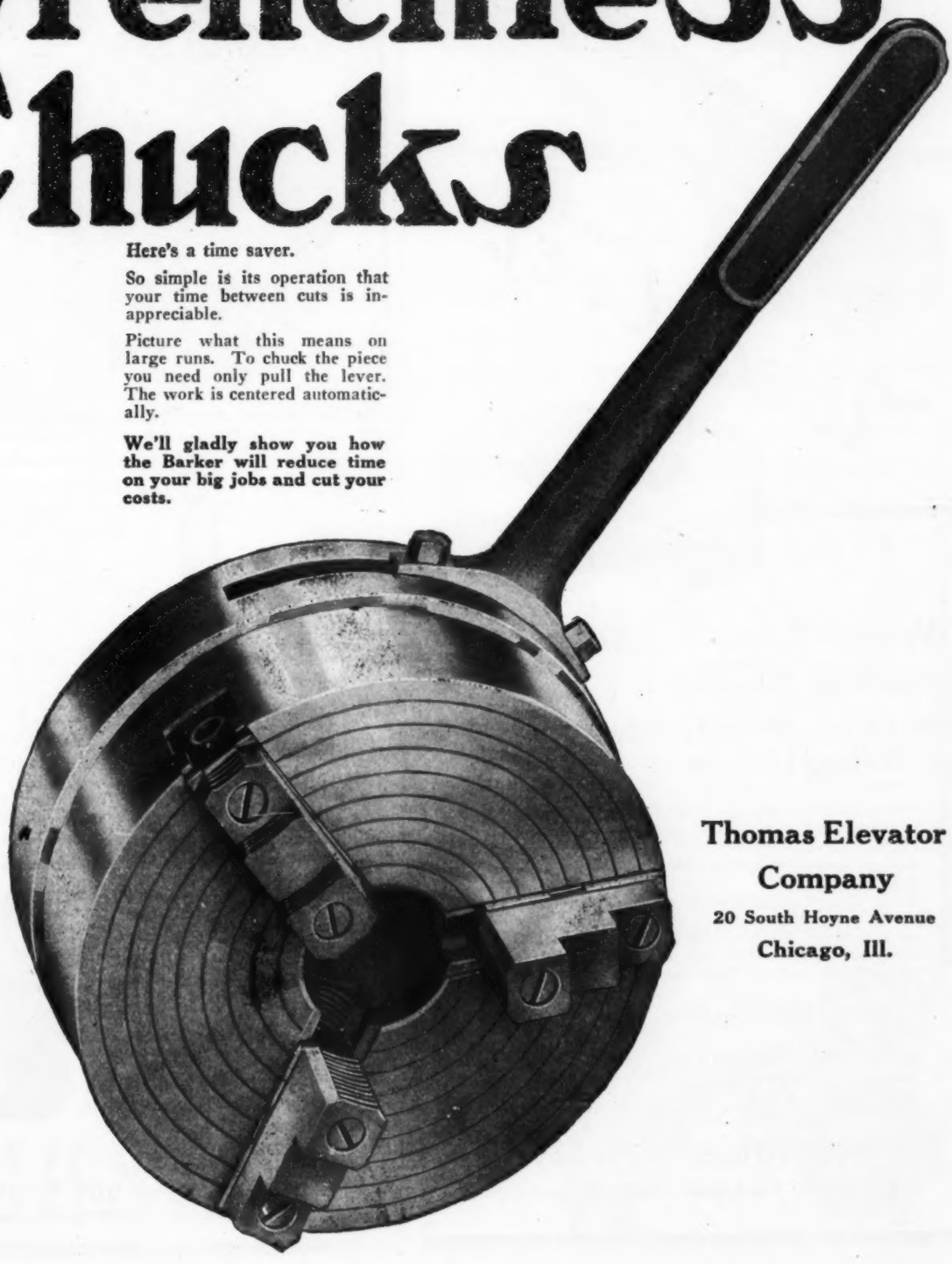
BARKER Wrenchless Chucks

Here's a time saver.

So simple is its operation that your time between cuts is inappreciable.

Picture what this means on large runs. To chuck the piece you need only pull the lever. The work is centered automatically.

We'll gladly show you how the Barker will reduce time on your big jobs and cut your costs.



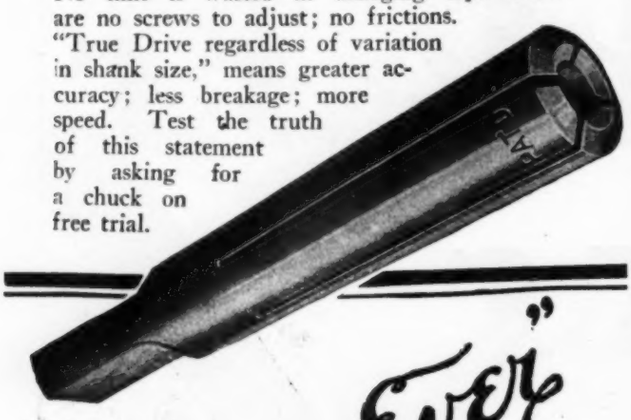
Thomas Elevator Company
20 South Hoyne Avenue
Chicago, Ill.

"Wear-Ever" Tap Chuck

You Can Speed Up Tapping and at the Same Time Cut Tap Cost

"Wear-Ever" Tap Chucks drive taps true and thereby reduce breakage.

No time is wasted in changing taps—there are no screws to adjust; no frictions. "True Drive regardless of variation in shank size," means greater accuracy; less breakage; more speed. Test the truth of this statement by asking for a chuck on free trial.



"Wear-Ever"

"Wear-Ever" Adjustable Spacing Collar

The Quick, Positive Spacer for Milling Cutters

"Wear-Ever" Spacing Collars eliminate the delays between jobs. They have made the old practice of cutting paper shims obsolete in a large, constantly increasing number of big shops.

The "Wear-Ever" collar is adjustable in increments of .002 inches over a range of .024 inches. There are no threads to cause trouble; adjustment is positive; faces are always true and parallel. Collar is thin and can be used in close quarters.

Sent on Free Trial.

Dealers: This Tap Chuck and Spacing Collar have made good. The demand for them, already great, is growing as a result of increased publicity.

Scully-Jones Company
649 Railway Exchange Bldg., Chicago, Ill.

SKINNER
DRILL CHUCKS
"NEW MODEL"

The Skinner "New Model" Drill Chuck is especially adapted for all light and rapid drilling, such as is done on sensitive Drills and hand Lathes, and where accuracy is required. The Chuck is operated by hand, and tightened by means of a spanner wrench.

Prices and complete description sent on request.

Manufactured in three sizes

The Skinner Chuck Co.
Main Office and Factory,
New Britain, Conn.
New York Office:
94 Reade St.
San Francisco Office:
Rialto Building.
London Office:
139 Queen Victoria St.

THIS IS THE NEW BRITAIN BALL BEARING HAND OPERATED DRILL CHUCK with Morse Taper Arbor as an integral part of the Chuck.

Also furnished with taper hole for separate arbor.

MADE IN FIVE SIZES ranging from 0 to 3/16 capacity to 0 to 1".

Made of steel throughout, all wearing parts being hardened the ball bearings reduce the friction to a minimum.

New Britain Drill Chucks

SAVE trouble and experiments.

LABOR is saved by the fact that TIME is not lost in looking for the wrench that has become misplaced or broken.

AND this chuck will prolong the life of your drills, as it does not grip harder than is necessary to do the work because it is self-tightening.

EXPENSE and maintenance is to be considered when purchasing drill chucks. The New Britain Ball Bearing Drill Chuck has no gears to become clogged or broken; no wrench to become misplaced.

Let the Chuck Prove It.

Union Manufacturing Co.
New York Office: 26 Cortlandt St.
New Britain, Conn., U. S. A.
Makers of a Complete Line of Chucks

A Report On GARVIN Wrenchless Chucks

from a large brass goods plant advises a 50% reduction in cost by the use of these chucks. Is this not worth while investigating at your plant?

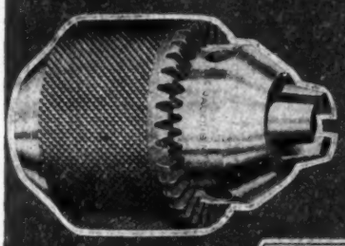
Two and Three Jaw Carried in Stock

For Further Information { Ask Your Dealer or Write Us Direct

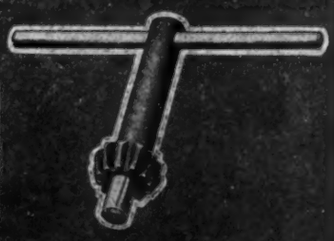
Full description in Chuck Catalog.

The Garvin Machine Company
Spring and Varick Sts. 50 Years in New York City

Jacobs IMPROVED DRILL CHUCK



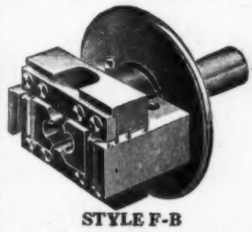
World Famous



The secret of their success is no secret at all, its merely their Superiority

JACOBS MFG. CO.
HARTFORD CONN.
U.S.A.

A SOLID DIE WHILE CUTTING, YET OPENS AUTOMATICALLY



STYLE F-B

Adjustable Gib Slide Assures PARALLEL THREAD Closer to Shoulder than Any Other Opening Die

400 half-inch Steel Conduit Connectors **per hour,** cut with **Errington Style "F-B" Rotary Die Head,** after having been adapted for the above work by our Engineering Department. This work has parallel pipe straight thread cut right up to shoulder.

The "Errington" is not only "The Simplest Die That Opens," but the only die that opens and closes while rotating; that can be used on Drill Press, Engine Lathe or Turret Lathe; a Special Tool on **each** job, yet easily adapted to General Work.

Twenty Years' Special Engineering Experience back of each tool to help make a record on your work.

Give us a trial.

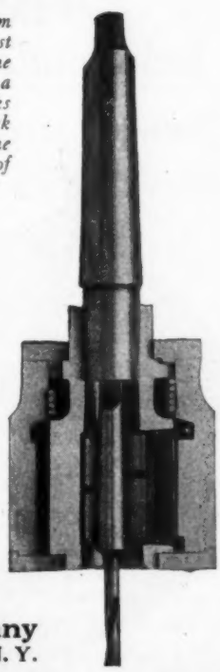
ERRINGTON, 41 Cortlandt Street, New York City
136 W. Lake Street, Chicago

Catalogue Francais: Edgar Bloxham, Paris, 12 Rue du Delta.

Another tells us—

"We are using your Wahlstrom Automatic Drill Chuck and like it first rate as we can save considerable time changing drills, and are able to use a number of drills that had broken shanks (tangs) which without your chuck would have been worthless. This alone would amount to more than the price of the chuck."

The above is from one of Canada's largest towing and wrecking concerns. And so we could go right on down the line quoting pleased expressions without number from Wahlstrom enthusiasts.



Drill changes with a Wahlstrom are made almost instantly—and without stopping the spindle. If you have been discarding taper shank drills because of broken tangs, stop it. The jaws of the model at the right hold **not the tang, but the entire shank,** without chance of slip or danger of chewing.

Write for descriptive circular and we'll tell you about our trial offer.

Wahlstrom Tool Company
5520 Second Avenue, Brooklyn, N. Y.

WAHLSTROM

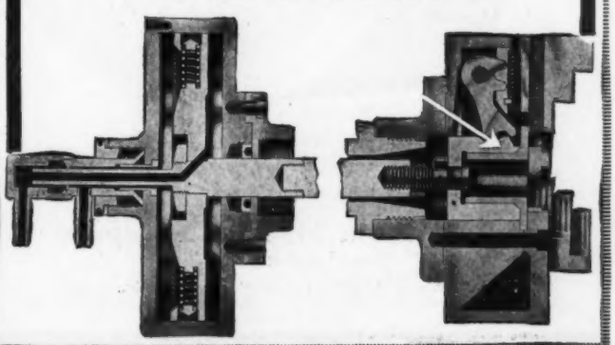
AMERICAN
Pneumatic Chuck

The advantages of using Pneumatic Chucks are well known to every manufacturer.

American Pneumatic Chucks possess the labor-saving attributes which have brought high favor to air-operated gripping equipment, and in addition have many mechanical refinements which insure efficient operation on one-third less air consumption.

Our bulletin gives full description

Neidow & Payson Co.
9 So. Clinton St., Chicago



Avoid Trouble by Using

THE HORTON-MORROW CHUCK

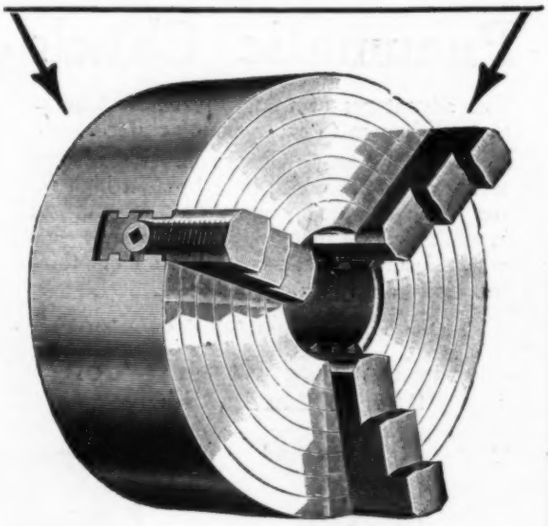
The screw and releaser of this hand-operated, ball-bearing, self-tightening drill chuck make sticking impossible, it releases quickly and unresistingly.

Designed especially to drive high speed drills without slipping regardless of the feed and pressure.

Send for Catalog No. 16. It gives details and prices of our full line of chucks.

The E. Horton & Son Company
Windsor Locks, Conn., U. S. A.

The "Whiton" Reversible Jaws Should Interest You



Changed to "Universal" or "Independent" by simply applying wrench to scroll or screw mechanism. Ask for catalog showing all styles of chucks.

D. E. Whiton Machine Company
New London, Conn.

Sole European Agents—Selson Engineering Co., Ltd.
"Whiton" Chucks sold and kept in stock by principal dealers all over Europe.

Trade PRODUCTION Mark

Independent 4-Jaw Chuck

Delivery **$26.00** Immediate

8 in. Diameter

"If you break it we send you a new one."

NEW JERSEY MACHINERY EXCHANGE
21-23 MECHANIC ST., NEWARK, N. J.

Bench Legs and Building Restrictions

The Essential Element of the Modern Bench.

THE shortage of labor, materials and transportation facilities has for some time made necessary the suspension of building operations in all but essential industries.

The cessation of hostilities, however, has already resulted in a considerable modification of this restriction. A short time will no doubt witness its complete removal.

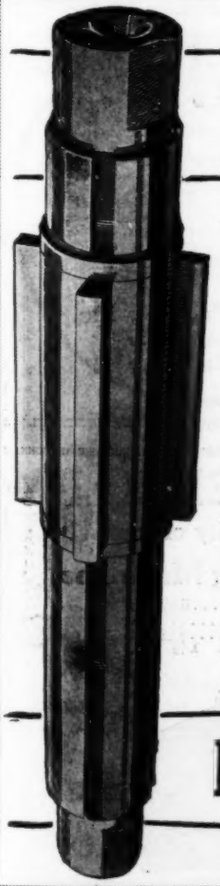
New factories and extensions to existing plants will at once be started, the production of equipment for which will materially assist in maintaining the momentum of the fly wheels of industry during the transition from war to peace conditions.

Most of these factories will require benches. All benches require legs.

"N-B" Legs support more benches than all others.

There must be a reason! Bulletin No. 1200 explains.

The New Britain Machine Company
New Britain, Conn., U.S.A.



INCREASED

NICHOLSON Expanding Mandrels

One set of nine Nicholson Expanding Mandrels affords an instant fit for any hole—round or square—from one to seven inches. Quick to insert; quick to remove.

No hunting around for a different Mandrel for every job.

Your machines will be producing every minute.

Put "Nicholsons" on the job in **your** factory.

Write now for free 30-day trial—there is no obligation involved.

W. H. Nicholson & Co.
114 Oregon St., Wilkes-Barre, Pa.

PRODUCTION

QUICTITE

Full Automatic Drill Chucks

present a mighty inexpensive way to multiply drill press profits. They enable you to change drills in a jiffy, without stopping the spindle. They grip hard and don't mar the drill shank.

Made in two sizes—No. 6 for ⅛ in. to ⅜ in and No. 8, ¼ in. to ½ in.

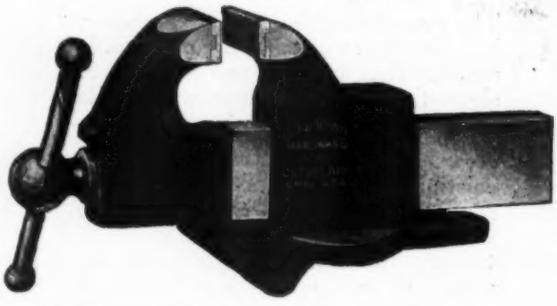
Write us for details and booklet.

Eastern Tube and Tool Company, Inc.

Offices:
594 Johnson Avenue, Brooklyn, N. Y.

Factory
41-59 Gardner Avenue, Brooklyn, N. Y.

COLUMBIAN
Malleable Iron Vises



We manufacture the most complete line of Vises in the world. Our large stock insures prompt delivery.

Ask for our No. 1803 Catalog.

The Columbian Hardware Co.
Manufacturers **Cleveland, O.**

"CHAMPION"
Portable Vise Stand
Adds Convenience to the Work

Illustration shows one of our most popular shop furniture specialties. A favorite with those who place the greatest value on convenience and time.

The Champion line of Vises is superior in design, most convenient for the workman and meets all modern conditions.

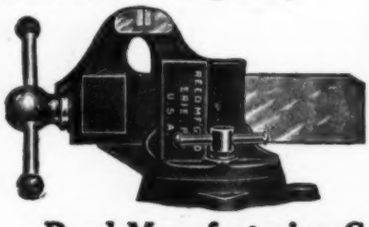
Do you use Champions? If not, why not?

Catalog describes full line

The Western Tool & Mfg. Co.
Springfield, Ohio, U. S. A.

Our 3 Aims

1—Easy working qualities
2—Lasting qualities
3—Entire interchangeability

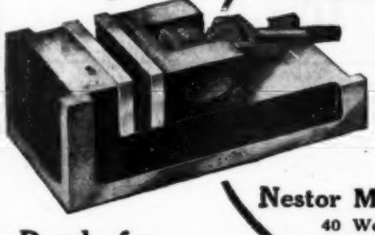


Reed Vises embody these three important features. They are highly developed, carefully designed and made and worth more money than we ask for them.

Write for catalog

Reed Manufacturing Co., Erie, Pa.

NESTOR



the quick-acting drilling vise that eliminates all need for changing position of work. To drill at right angles simply turn on side, or end. Time saved quickly covers its moderate cost.

Nestor Mfg. Co., Inc.
40 West 13th St.
New York City

Ready for Prompt Delivery

KNURL HOLDER

Two Sizes

For Turret Machines

Adjustable to knurl all work up to 2¼-in. diameter.

Foreign:
France, Italy, Spain, Holland: Fenwick, Freres & Co. Great Britain: C. W. Burton, Griffiths & Co.

High Speed Drilling Attachment or

DRILL SPEEDER

Three Sizes

DRILL VISE

Three Sizes

With and Without Jig Attachments

Often used on miller, shaper or planer.

Send for circulars.

The Graham Mfg. Co.
Providence, R. I.

IMMEDIATE DELIVERY

can be made on a quantity of these

Plain Vises for Milling Machines

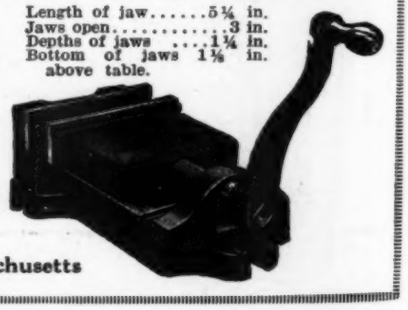
$20.00

F. O. B. Greenfield

Machine Tool Division

Greenfield Tap and Die Corporation
Greenfield, Massachusetts

Length of jaw.....5¼ in.
Jaws open.....3 in.
Depths of jaws ....1¼ in.
Bottom of jaws 1⅛ in. above table.



You put the handle where *you* want it

in the

STARRETT IMPROVED VISE

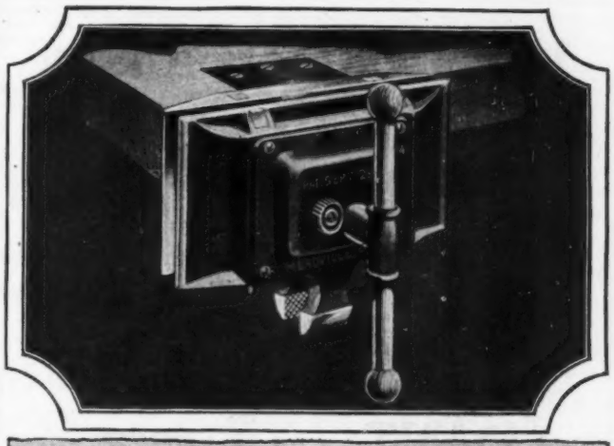
SET the jaws to suit. Then release the handle to where you want it—out of your way—by pulling against the spring that holds it in position. It stays put!

That's only one of the features that make the Starrett Improved Vise the best vise. The swivel base and the adjustable taper attachments are two others.

These three reasons are enough for mechanics and manufacturers who believe in using only the best tools. There are other reasons, of course, and

"Something New in Vises" gives them all

ATHOL MACHINE CO.
ATHOL, MASS.



Yost Vises

Woodworker's Vise

This Yost Improved Universal Woodworker's Vise combines in itself "all-around" convenience. It meets the endless variety of requirements of the woodworker.

This Vise will securely hold all classes of work. It can be adjusted to a variety of awkward positions, thus permitting the workman to place his work in a position to suit his convenience.

The time and energy saved by the operator with this vise, makes money for you, because it enables the operator to substantially increase his output.

Width of jaw, 8 x 16 in.
Jaw open, 14 in.
Weight, 80 lb.

Ask us for our new Catalog

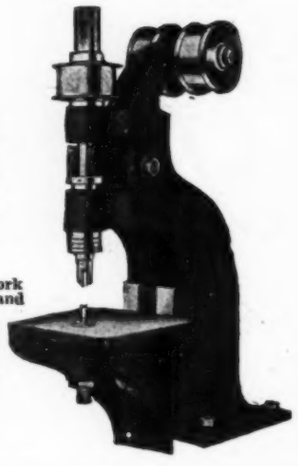
YOST MANUFACTURING CO.
Meadville, Pa. U.S.A.

19,500 Rivets a Day

With This Rivet Spinning Machine

Working ten hours a day the actual production of 19,500 of these riveted pieces means 32 or more each minute, and still it is possible to almost double this output with a

GRANT



if you can place the work fast enough. It spins a rivet into place in about one second — and that without bending or injuring the shank—leaving an absolutely smooth finish.

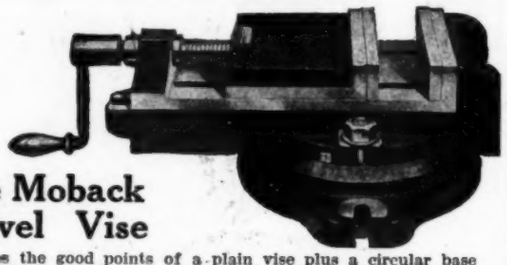
Send us samples of your work for shop cost estimate and catalog.

THE GRANT MFG. & MACHINE COMPANY
85 Silliman Avenue
Bridgeport, Conn.

Riveting with Elastic Rebounding Multi-Blows

The Townsend High Speed Riveting Machine strikes 80 to 1000 uniform, tapping blows every second. Quick as a wink, clean, smooth, finished heads are put on rivets. Different heights of rivets can be handled at one setting. The work itself is never distorted. Write for circulars.

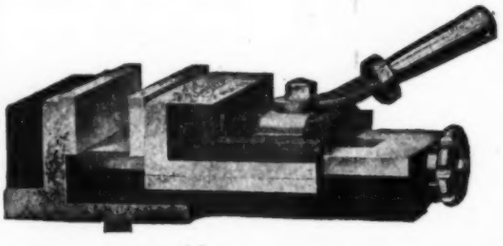
H. P. Townsend Manufacturing Company
Hartford, Conn.



The Moback Swivel Vise

combines the good points of a plain vise plus a circular base graduated in degrees. The vise can be taken off the base and used plain if desired. Also has cross-slots and side ears, and the jaws are hardened and ground. Sizes 4 to 8 in. **Let us send particulars.**

Moback Tool & Machine Mfg. Company
330 Atlantic Ave., Boston, Mass.
Foreign Agents—Alfred Herbert, Ltd., Coventry, England; Milan, Italy; Yokohama, Japan; and Calcutta, India.



No Tools to use — No Time to lose

Adjust with your fingers and tighten with the cam. *Write us.*

The Ketchum Tool Equipment Co., Bridgeport, Conn.

LAMINATED SHIMS

Made of LAMINUM. All features of solid shims, plus advantages of loose-leaf shims. They allow quick, accurate adjustments and give a clean, smooth surface always. Send for sample.

LAMINATED SHIM COMPANY
533 Canal Street, New York
Dime Bank Bldg., Detroit.
England, R. A. Rothernel, 6 Great Marlboro St., London, W.

One Man Cleaning Your Castings or Six?

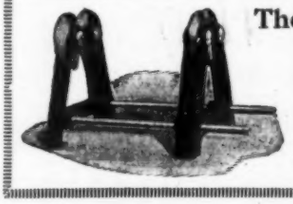
It will take more than six men with brushes to equal the cleaning one man can do with a Paxson-Warren Sand Blast Machine. It cleans thoroughly—no complicated parts—substantially built. *Write for circular.*

J. W. Paxson Company, 1021 N. Delaware Ave., Phila., Pa.
MANUFACTURERS' FOUNDRY EQUIPMENT AND SUPPLIES.

OXYHYDROGEN

QUINTESSENCE OF PURITY

INTERNATIONAL OXYGEN COMPANY
115 Broadway, New York



The Anderson Ever-Ready Balancing Ways

are extremely sensitive—require no adjusting. Made of quality materials, in several sizes. Write for full description and prices.

Anderson Bros. Mfg. Co.
120 Morgan St., Rockford, Ill.

Diamond-Fibre

Diamond State Fibre Company *A Mark of Quality A Sign of Service*
Bridgeport, Pa. (Near Philadelphia)

Metallurgical Research and Heat Treating Engineers

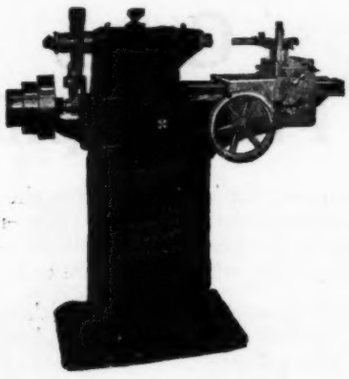
Microphotographs Physical Tests Chemical Analysis

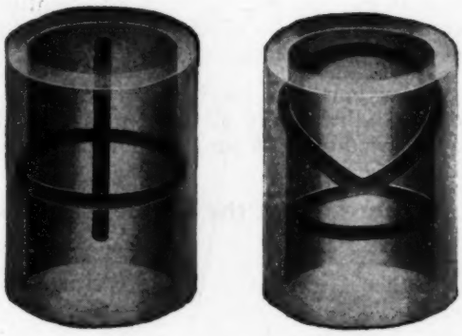
American Incandescent Heat Co., Inc.

The Best and Simplest Method for Cutting Oil Grooves

Stop cutting oil grooves by hand. Get the Fischer Oil Groover and one of your boys can do 10 times the amount of work that an experienced man can do by hand—**and do it better!** The Fischer works automatically and cuts any length groove within its capacity—5 x 8 inches—without distortion of bearing.

Some claims to make, but the Fischer Oil Groover will back them up. Bulletin?





Fischer Machine Company

310-316 N. 11th Street, Philadelphia

Chas. A. Strelinger Co., Detroit, Mich. Foreign Agents: Coats Machine Tool Co., Ltd., Thanet House, Strand, London, Glasgow and Newcastle-on-Tyne; Aux Forges de Vulcain, Paris, France. Yamatake & Co., Tokyo, Japan. Henry Coe & Cleriel, Milan, Italy. Allied Machinery Co. of America, 120 Broadway, New York, for Switzerland, Spain and Portugal.

Practice Economy in the Finishing Room

Our Hilo "Better-the-Finish" Laboratory may be able to help you.

Producing an article in a shorter time and at less cost means much to the Manufacturer, as Industry settles down to keen, Peace Time Competition. Manufacturers should do their utmost to give their product every possible advantage. Guesswork must be eliminated and safe, sure methods substituted.

The long and varied experience of our

HILO

"Better-the-Finish" Laboratory

may aid you materially in cutting down your finishing costs. Perhaps your methods can be improved. A change in manner of application and in materials may prove helpful.

Let us take up your problem from every angle—method of application, time and temperature of bake, quality of materials, etc. We will suggest the most economical method or system for your work.

The study of your finishing problem is absolutely free.

Avail yourself of this service.

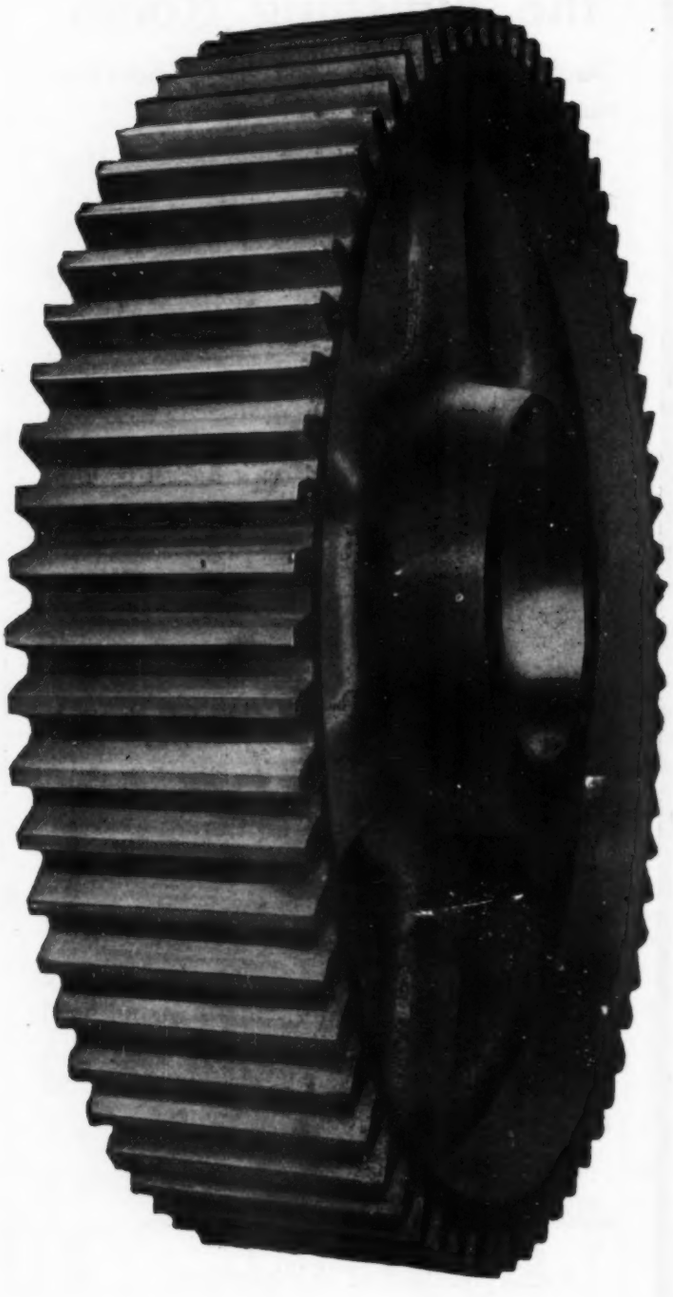
Write us today.

Hilo Varnish Corporation

5 Gerry St., Brooklyn, N. Y. Chicago, Ill.

Pacific Coast Representatives—The Brininstool Co., Los Angeles, Cal.

"The Day After Christmas We Get Back to Gears"



"Everybody has had a wonderful time. And everybody has our very best wishes for a prosperous New Year.

"But there's still some work to do," continues Phillie Gear, "and so, the morning after, I want to talk to you for about two minutes about some REAL gears—

Gears Philadelphia

"Suppose, for instance, you should have a breakdown at the turn of the year—not that the turning of the year would cause it—and needed gears in a jiffy, what would you do?

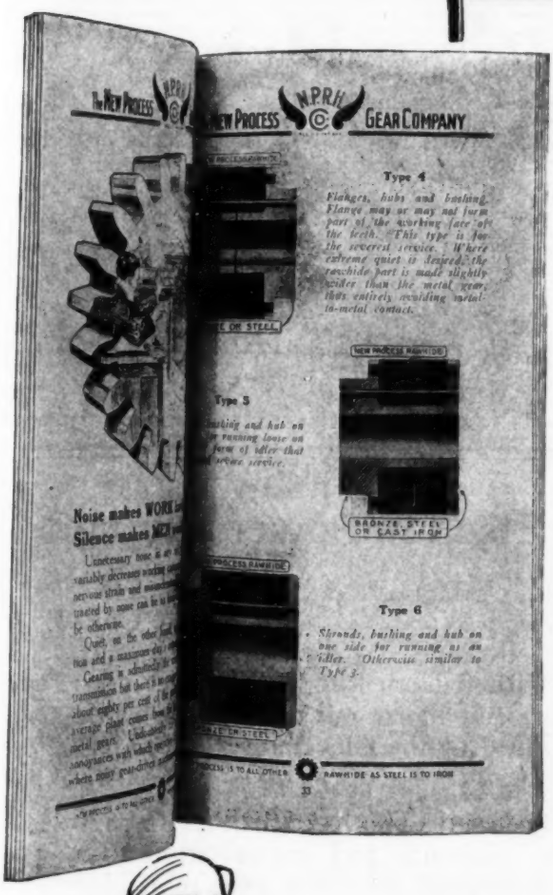
"Never thought of it? Well, it's time to think about it—for nine-tenths of wisdom consists in being wise in time, as Oyster Bay says.

"I tell you what to do in such a case, order Gears Philadelphia. You will get tip-top gears in that way and get them quick as lightning. Of course not quite as quick as lightning—but near enough to it to satisfy your most ardent desires.

"You know we specialize in handling RUSH orders. Practically all sorts of standard gears are carried in stock for that purpose," concludes Phillie Gear.

Be sure to get the Phillie Gear Book for the New Year.

Philadelphia GEAR Works 1120-1128 Vine St. Philadelphia



"Noiseless Gear Driving"

A book that helps to get better results in your gear practice.–

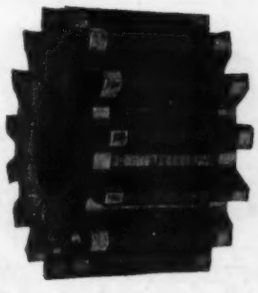
If your metal gears cause noise and vibration, and your machines suffer thereby, you should read our book on "Noiseless Gear Driving." It is a complete encyclopedia on this method of transmitting power and discusses the subject from every angle. It describes how New Process Rawhide Pinions are made, shows typical applications on various types of machines, and gives other useful and valuable information.

NEW PROCESS NOISELESS PINIONS

By substituting New Process Rawhide for metal pinions a cushioning effect is introduced which takes up the inequalities of tooth surface and eliminates vibration. New Process pinions absorb the shocks of service that destroy machine alignments.

Not only is smooth machine operation maintained for a much longer period than with metal gears, but the danger and expense due to breakage of the steel companion gear are largely overcome. You seldom find a stripped tooth where New Process Noiseless Pinions are used.

Heed the signs of the times—Our book "Noiseless Gear Driving" points the way.



NEW PROCESS GEAR CORPORATION
SYRACUSE, N.Y

101

GRANT GEARS

accurately cut in cast iron, steel, brass, rawhide and fibre.

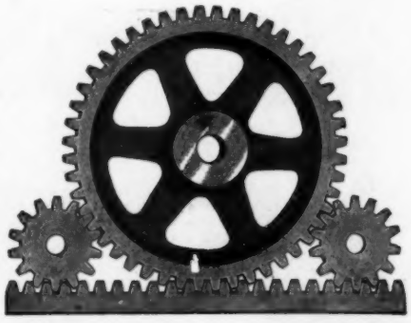
Our large new factory equipped with the very latestgear cutting machinery and a works organization that is backed by 40 years' experience in gear cutting enables us to meet every possible gear requirement from minute pinions to wheels 6 ft. in diameter.

We are prepared to give immediate attention to rush orders and can make prompt shipments on any special type of gearing.

Large stock of standard cut gears constantly on hand, ready to be shipped at once.

Send us your blueprints for estimate. Let us solve your gear problems.

Write for interesting catalog containing full stock list and valuable gear information.



Grant Gear Works, Inc.
151 Pearl St. Boston, Mass.
Geo. B. Grant

CLEVELAND WORM GEAR REDUCTION UNITS

Pays For Itself in Power Saving

AS HIGH as 500 H.P. is being transmitted by Cleveland Worm Gear Reduction Units with a friction loss of only 3 or 4 per cent. Contrast this with friction loss in spur gear trim or belt slippage and figure out what is the value of the power saved by the Cleveland Worm Gear Reduction Unit.

Other advantages are: Long life, silence, compactness, complete enclosure and special fitness for heavy duty. Any speed reduction, even in as high ratio is 1000 to 1, is possible. Over 1,000,000 H.P. are now transmitted by Cleveland Reduction Units.

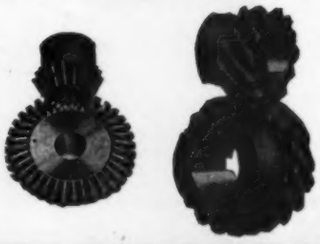
Our engineering department is maintained to help you—why not let it?

The Cleveland Worm Gear Company
Largest Exclusive Manufacturers of Worms and Gears in the World
Cleveland, Ohio

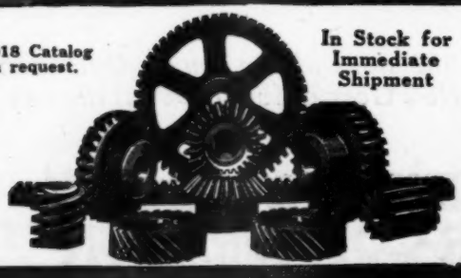
C. F. Quicke & Co.
315 Euston Road
London, Eng.

The Industrial Equipment Co.
Oakland,
Calif.

STANDARDIZED BOSTON GEARS



1918 Catalog on request.



In Stock for Immediate Shipment

BOSTON GEAR WORKS — NORFOLK DOWNS, QUINCY, MASS.

—And Here's a Test of Strength

Five years ago this 120 inch "Pond Planer" was equipped with a Fabroil Gear as the main drive off the motor pinion.

The Fabroil has withstood the strain of the constant reversing wonderfully—showing very little wear and is from all appearances good for another five years' service.

FABROIL GEARS
SILENCE-STRENGTH
And they are durable
SILENCE and strength, symbolized by the forest and rocks, emphasizes two great advantages to be gained by the use of Fabroil Gears.
Fabroils, by silencing your gear trains, reduce vibration, thereby increasing the life of your machines. They will outwear cast-iron or brass gears and absorb shock that would destroy most cast-iron gears
General Office, Schenectady, N. Y.
COMPANY

120 inch Niles-Bement-Pond Planer.

40-16

GE FABROIL GEARS

GENERAL ELECTRIC COMPANY

General Office, Schenectady N.Y. Sales Offices in all large cities

Reliability in Gearing

TODAY the demand for steady operation and maximum production is greater than ever before.

Since gears are more widely used than any other means of transmitting power, they are therefore responsible to a greater extent for the steady unbroken operation of your machines than any other part.

Innumerable combinations of material are possible in gearing applications, but it is the organization that thoroughly understands what results the various combinations have on different applications that can best supply the gearing for your particular needs.

Our thirty years' experience back of an efficient force of engineers, will solve all your gear problems. Let us prove it.

R. D. NUTTALL CO.
Pittsburgh, Pa.

Nuttall Gears

EVERY GEAR REGISTERED

Steel for Service

Better Gears Are Cheaper

Gear performance in some of the largest shops in this country proves conclusively that it pays a manufacturer to select his gears upon a basis of ultimate economy of expenditure.

Gears which are cheaper when first cost alone is considered, usually run so high in money cost, time cost and loss of product as to prove dear wherever records are kept.

Gears made from

Carnegie Rolled Steel Blanks

are manufactured for heavy duty service; their fine performance has proven the correctness of their design and their superiority of manufacture.

Such gears may cost slightly more, but each one will stand up under heavy duty service as long as four cast steel gears. The decreased number of removals and installations and the security afforded continuous production are additional advantages.

Use them to cut down your gear expense.

Carnegie Steel Company

General Offices: Pittsburgh, Pa.

1094

Unnecessary Noise
in a Machine Shop

carries a penalty in the form of decreased production. The noise irritates the workman. It affects his capacity. The noise makes it difficult to transmit verbal orders—affects his accuracy.

The most unnecessary noise in the machine shop is the grating, nerve-racking clatter of gears—of insufficiently or poorly lubricated gears.

Unnecessary because preventable.

Preventable by

Texaco Crater Compound
The Great Gear Lubricant

It prevents noise because it removes the cause of most noise. It lubricates so thoroughly as to prevent wear. Where there is no wear, there is no noise.

It coats each and every tooth of gear or pinion with a heavy film of resilient lubricant. This film cannot be squeezed out by the pressure nor flung off by the speed.

The teeth are kept coated.

So that, instead of metal-to-metal contact of gear teeth, the impact is taken up by this adhesive film of Texaco Crater Compound, and a continuous muffling or elimination of the noise is the result.

A number of builders of machines are advising their customers to use Texaco Crater Compound. Some are lubricating the gears of every machine they sell with Texaco Crater Compound before shipment.

A line to the address given below will bring you more information.

THE TEXAS COMPANY
Dept. A-3, 17 Battery Place, N. Y. C.
New York Chicago Houston
Offices in Principal Cities

There Is a Texaco Lubricant for Every Purpose

CROFOOT GEARS

are produced under standards and with equipment which insures the fullest possible degree of satisfaction to our customers. We would be pleased to quote on any of your gear requirements.

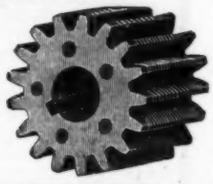
Crofoot Gear Works
Incorporated
31 Ames Street Branch A
Cambridge, Boston, Mass.

For Quiet-Running Machinery

RAWHIDE GEARS

Manufactured by

The Horsburgh & Scott Co.
Cleveland, Ohio



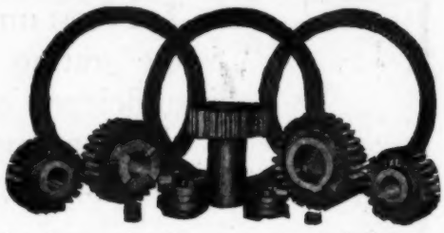
MEISEL QUALITY

The same superior quality is maintained throughout the entire line of Meisel Gears — accuracy, durability and expert workmanship. Also Automatic Screw Machine Products up to 5¼-in. diameter.

Meisel Press Mfg. Co.
946 Dorchester Ave.
Boston, Mass.

Reg. MP

Your Gear Problems Solved



We have dug down under the grass roots to find the solution to most every gear problem known. We've made a practical study of gear requirements. Prompt delivery made on sample or contract orders. Send today for "Gear Problems" which explains just what you may be wanting to know about.

FOOTE BROS. GEAR & MACHINE CO.
210-220 N. Carpenter St., Chicago, Ill.

Every Tooth Does Its Bit

There are no "slackers" among Cincinnati Gears. Every tooth is "up and at 'em" when the "push" begins.

We put Cincinnatis through such a rigid "physical" test that none except the absolutely fit ever reach the front.

CINCINNATI SERVICE

awaits your pleasure in the matter of bevel, mitre, spur, spiral, internal and rawhide gears, worms and worm wheels. It is quick, reliable and justly priced. Get our Catalog "C."

Cincinnati Gear Co., Cincinnati, Ohio

"Zones of Quiet"

Albaugh-Dover accurately generated Gears are real "ZONES OF QUIET"—unusually smooth and noticeably silent in operation. If you use gears, send us your Blue Prints or Sample Gears for estimates.

AD **ALBAUGH-DOVER CO.**
2100 Marshall Blvd., Chicago

GEARS

FAWCUS HERRINGBONE GEARS
Mill Drives . Turbine Transmissions
Spur Gears . Bevel Gears . Worm Gearing
FAWCUS MACHINE COMPANY. PITTSBURGH. PA.

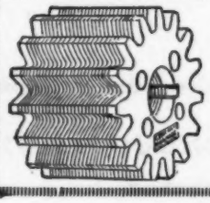
ALBRO-CLEM HINDLEY GEARING
WILL DO THE WORK
When Common Worm Gearing Fails
ALBRO-CLEM ELEVATOR CO.
503 Erie Ave., East, Philadelphia, Pa.

M-C GEARS

are accurately generated on our hobbers.

Let us cut your gears.

Meisselbach-Catucci Mfg. Co.
28 Congress Street Newark, N. J.



Chicago-Rawhide Pinions

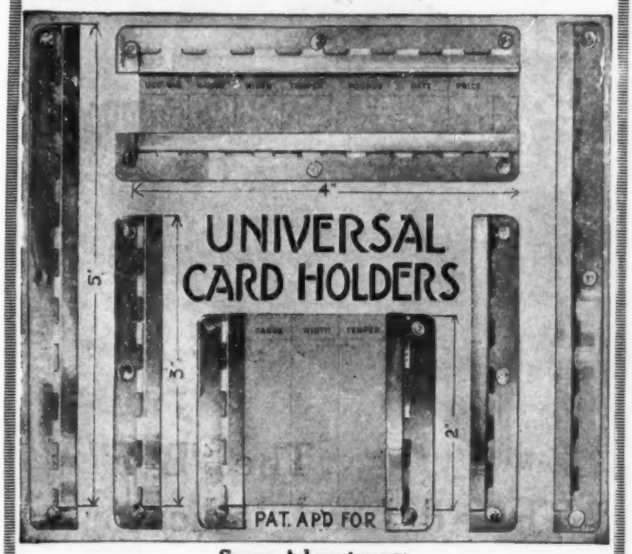
The best that selected material and careful workmanship can produce

The Chicago Rawhide Mfg. Co.
1301 Elston Avenue, Chicago, Ill.

No Waste of Steel in Making the "Universal" Card Holders

Now you can label your stock bins, shelves, trucks, stock boxes, etc., with any size label you wish.

We carry four sizes in stock, 2 in., 3 in., 4 in. and 5 in.; other sizes to order.



Some Advantages:

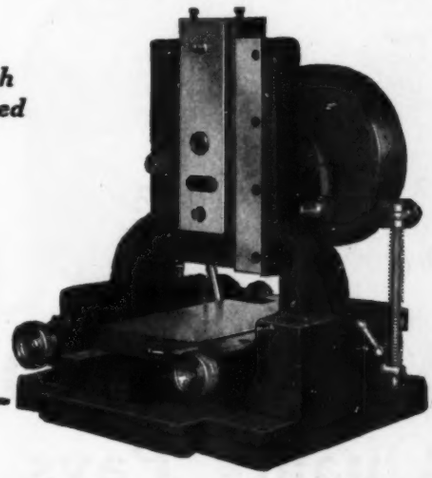
One size holder can be used for various size cards, can be used either in a vertical or horizontal position, can be manufacturned at a small cost, hence LOW PRICE. Take up but little room in transit or store room. Permits the use of nearly the entire card. Card can easily be put in or taken out.

Samples and price list on request.

DETROIT STAMPING COMPANY
(Makers of the Milling Machine Arbor Spacer)
951-957 West Fort Street, Detroit, Michigan

The "Penn" Automatic Slotting Machine

High Speed



A big production machine for accurately slotting keyways in small work on articles such as Motor Cycles, Firearms, Typewriters, Sewing Machines, etc. All adjustments conveniently and easily made.

Capacity—⅝ in. x 1 in.—5/16 in. x 1¾ in. keyway in cast iron; 5/16 in. x 1 in. in steel; 2 in. stroke, maximum.

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Automatic Spur Gears Cutting Machines
30 and 40 in. dia. 4 D.P.

Rotary Cut Spur Gears and Planed Miter and Bevel Gears CUT TO ORDER

THE FLATHER MFG. CO. FLATHER MACHINERY NASHUA N.H. U.S.A.

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BEVEL—SPUR—WORMS—SPIRAL
Up to 60 inches
We solicit your inquiries
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FREE FROM ANY AND ALL STANDARDS

Made by a new generating process, Maag Gears secure absolute freedom in the choice of the number of teeth, pitch and angle of obliquity, as well as other tooth dimensions. They assure greater economy and longer life. Write for catalog.

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Spurs, Bevels, Worm Gears, Spirals, Internals, equipped to handle work from 2 in. to 66 in. diameter

Delivery on Bakelite Pinions—One Day—*You Can't Beat That.*

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Adjustable or Rigid Goggles

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One pair or 20,000 per day

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Cut and Planed Gearing

of every description.
Let us remedy your gear troubles.
Special attention to rush work.
Accurate work and honest delivery promises.

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THE A. HERMANSEN RECUPERATIVE FURNACE

Easily regulated. Maintains high and even temperature.
Absolutely complete or non-oxidizing combustion.
Guaranteed saving of 20 to 60% in fuel.

WOOLWORTH BUILDING, NEW YORK

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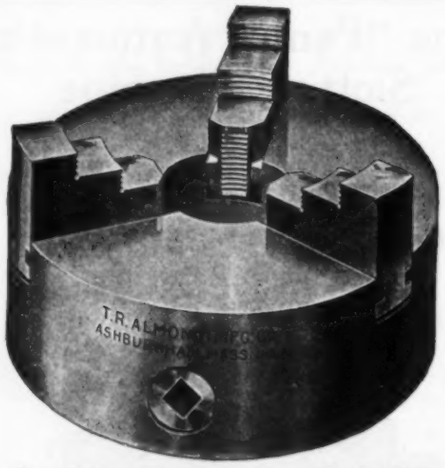
Muskegon Heights, Mich.

Manufacturers of Morton's Special Draw-Cut Railroad Shapers, Morton's Draw-Cut Cylinder Planers, Morton's Draw-Cut Frog and Crossing Shapers.

Write for Bulletins Nos. 6, 7 and 10-C.



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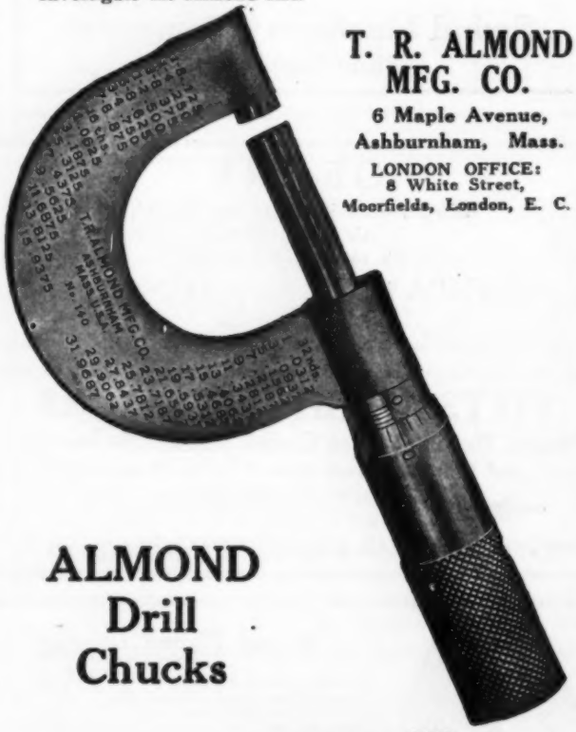
Quality Pays

Whether you require chucks or micrometers you will find it pays to specify "Almond."

Almond Chucks are powerful, accurate and durable.

Almond Micrometers are so finely finished they give accurate measurements indefinitely.

Investigate the Almond line.



T. R. ALMOND MFG. CO.
6 Maple Avenue,
Ashburnham, Mass.
LONDON OFFICE:
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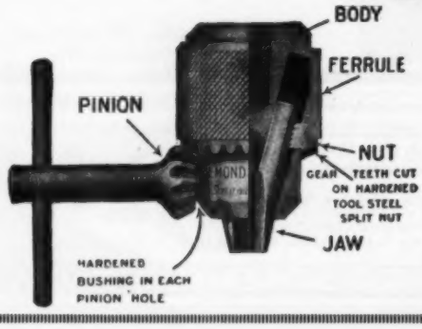
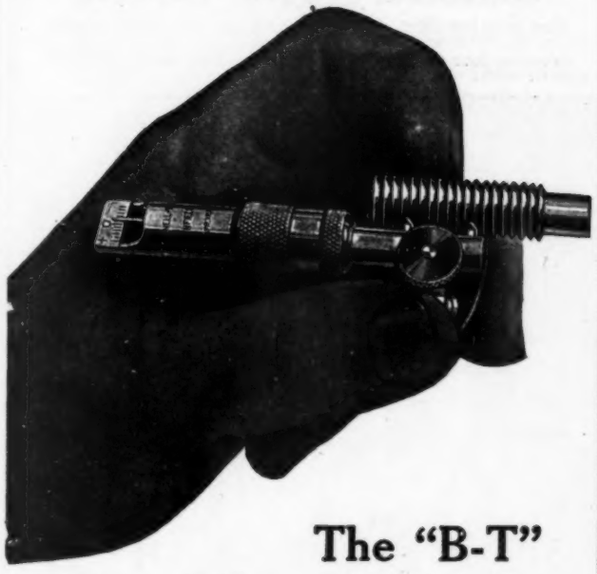
ALMOND Drill Chucks



Simple—Anyone Can Use It



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A simple, practical and inexpensive appliance that indicates accuracy or inaccuracy of both internal and external threads. A check-up on set-up of machine, work, tap, etc.—a preventive against waste caused by non-fitting threaded pieces.

Get the details in the "B-T" Indicator Bulle in

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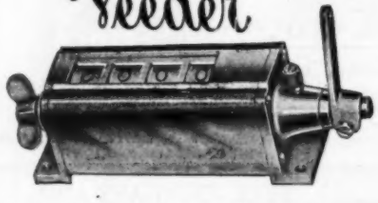
Veeder



***Set-Back* COUNTER**

Registers one for each reciprocating movement, corresponding with the operations of your machine. The counter for punch presses, metal stamping machines, etc.

Keep up machine output by keeping before the operator a definite figure to work for, and a definite production-standard to answer for. A Veeder Counter will do it; send for booklet.

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The New Dial Gauge

Reads to .001 inch Furnished with dial running from 0 to 100 if desired.

Here is the genuine Randall & Stickney Dial Gauge.

Randall & Stickney Gauges have long been known for reliability and accuracy and this gauge is a strictly high-grade product.

Read U. S. Bureau of Standards Circular No. 38 for their endorsement of Randall & Stickney Gauges.

Write now for any further particulars desired.

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Waltham, Mass.

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Each shop has its own peculiar requirements in high temperature control. Each line of work must be given individual attention if the highest efficiency is to be obtained.

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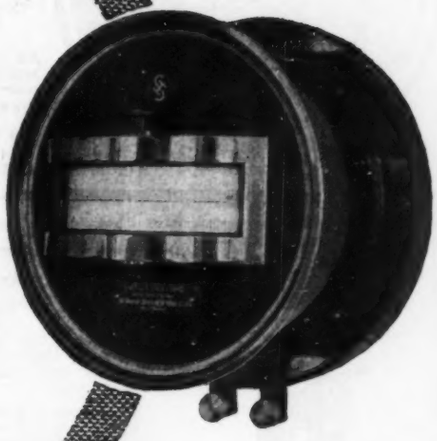
Pyrometer Service

Is being used by the most progressive shops in the country because of the superior service rendered. We specialize on Central Station Equipment. Our Engineers are prepared to meet your most exacting requirements.



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To set up an angle correctly without the aid of the Universal Angle Plate is precision work and requires an expert at high wages. Any mechanic can set up his angle correctly, immediately and without calculations of any kind if he has

THE UNIVERSAL ANGLE PLATE

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An electric machine for marking tools and metal articles for identification purposes, etc. Requires no acid—uses only electricity—lasts indefinitely.

Write us today for literature and state current available.

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A better way to mark economically

You'll find that the Dwight Slate Marking Machines are more economical and turn out better and neater work.

It will pay you to investigate this method of improving the appearance of your product. Get the Catalog No. 10.

We also manufacture Filing Machines, Grinding and Polishing Machines and Steel Stamps, and can serve you satisfactorily on your Steel Die Engraving.

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PROFITS INCREASE

A detailed check on machine productions almost invariably reveals chances to increase output without proportionate increased cost. The gain is **profit.** You now watch the results of each separate department; take the next logical step and check each machine of each department.

The PRODUCTIMETER

reduces your production figures to the cost of each piece so you can compute, to the fraction of a cent, your actual expenditures for material, labor and overhead. Manufacturing losses can't escape detection. A 30 days' trial is convincing. We take all the risk. Mention machine you will use it on when ordering.

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and *a one-minute* job at that. For it was done on the **Gorton Engraving Machine.** It takes i as much time as hand engraving and the quality of work is higher. It soon pays for itself.

Let us engrave a few sample pieces for you. Send us your name and address.

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Don't guess at costs—Know—

The **Calculagraph** eliminates all guess work. You can know the cost of each job exactly. The **Calculagraph** calculates and records the working time — in hours and tenths. Saves time all along the line — the mechanic's, the time clerk's, cost clerk and paymaster's time.

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International Standard
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HARDNESS TESTING
Is now done almost exclusively with
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DIRECT READING, can be operated by anyone with rapidity; measures softest metals and hardest steels without adjustment. Is the only instrument that properly agrees with others of its kind, and is used for ordering material to specification. Send for our booklet, free.

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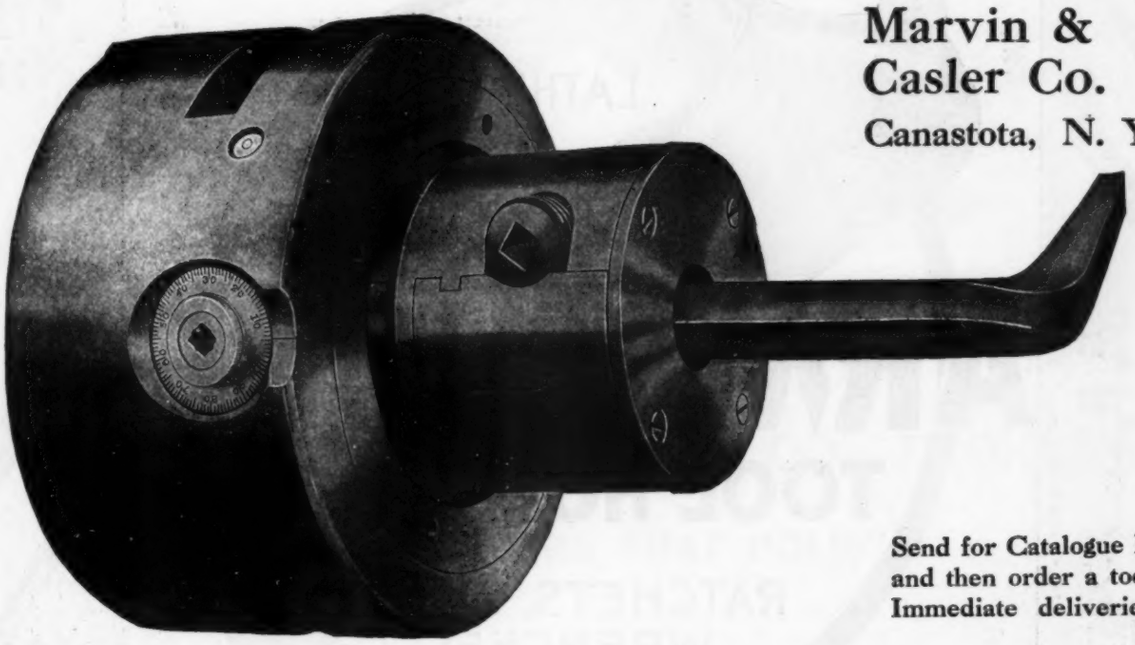
are as old as creation

The new way of boring them accurately to size is by attaching the Casler Offset Boring Head to the spindle of Milling Machine. It eliminates guesswork and cuts down the cost of your tool work.



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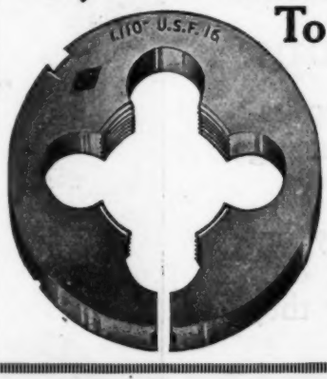
Send for Catalogue E, and then order a tool. Immediate deliveries.

Yes, We Make Them To Your Order



Taps, Dies, Counterborers, Cutters, Reamers

Also ask us about the Modern Lead Tester

The Modern Mfg. Co.
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Indicate in Any Position

No loosening of screws or nuts. The contact point is simply pushed to any desired position. Contact point is protected from damage by a patented friction device which automatically swings the contact point out of the way when the work presses too hard.

Small holes, thin shoulders and so-called inaccessible places are within the range of the Ideal. The simplest, strongest, most complete Indicator for the money—$3. If you don't agree we will refund.

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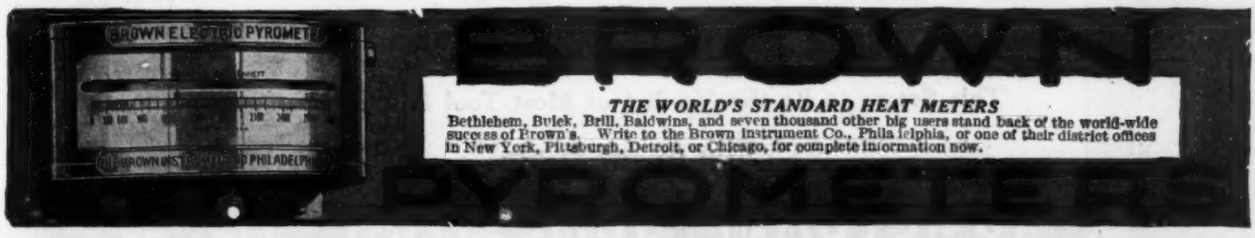

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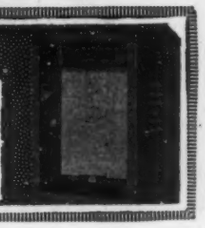
Bethlehem, Buick, Brill, Baldwins, and seven thousand other big users stand back of the world-wide success of Brown's. Write to the Brown Instrument Co., Philadelphia, or one of their district offices in New York, Pittsburgh, Detroit, or Chicago, for complete information now.

"OK" BRAND Drive Pin Punches

A variety of sizes and lengths for driving out pins, rivets and bolts. Made of high-grade steel. Ask to see assortment of sizes at your tool dealers.

West Haven Manufacturing Co. New Haven, Conn.

Thwing Pyrometers



High Resistance Indicating and Multiple Record Types for all industrial purposes.

Tell us your conditions and we will explain the economies or improvements that pyrometers will effect.

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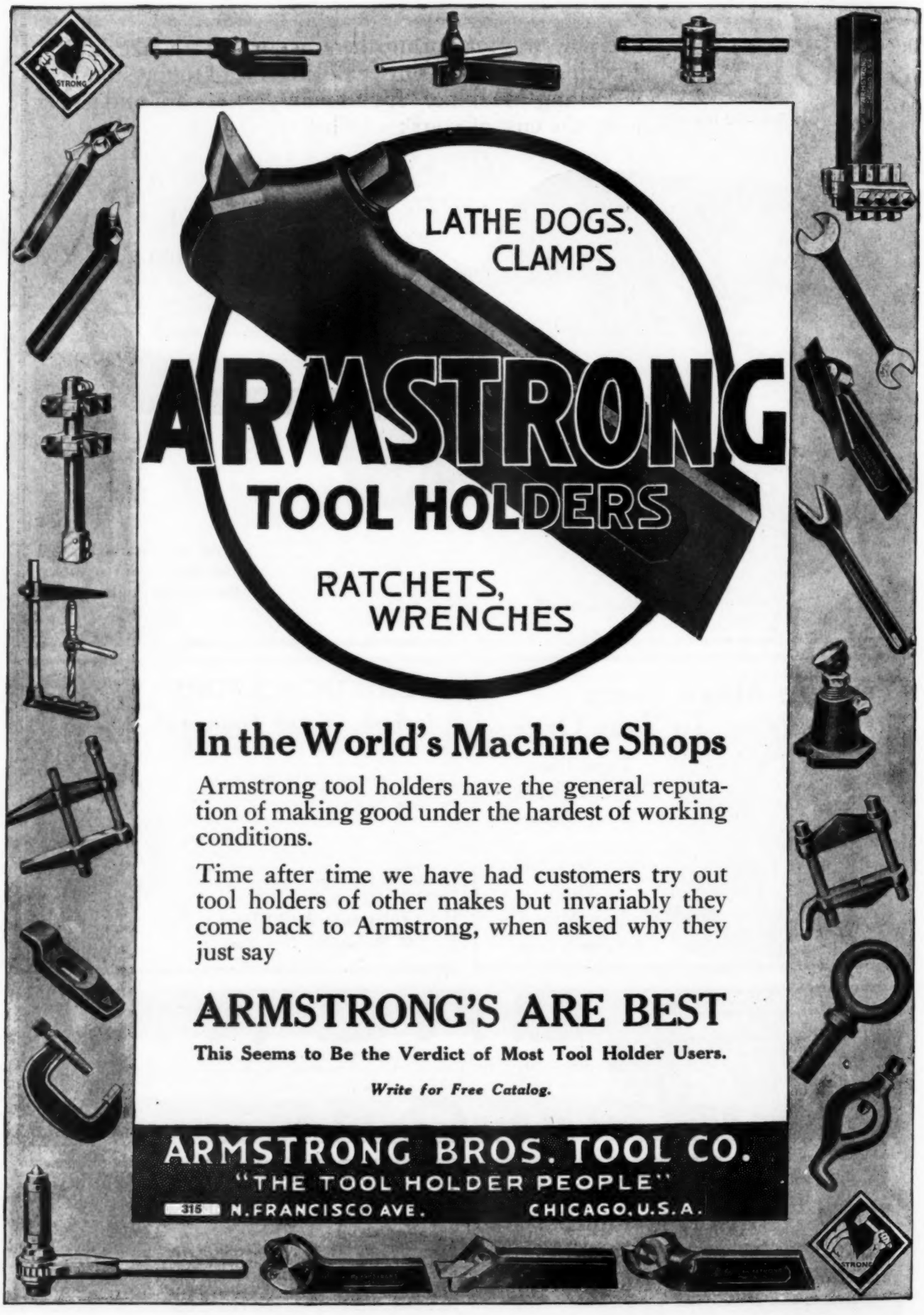

In the World's Machine Shops

Armstrong tool holders have the general reputation of making good under the hardest of working conditions.

Time after time we have had customers try out tool holders of other makes but invariably they come back to Armstrong, when asked why they just say

ARMSTRONG'S ARE BEST

This Seems to Be the Verdict of Most Tool Holder Users.

Write for Free Catalog.

ARMSTRONG BROS. TOOL CO.
"THE TOOL HOLDER PEOPLE"
315 N. FRANCISCO AVE. CHICAGO, U.S.A.

Williams' "Agrippa" Cutting-off and Side-Tool Holders

"THE HOLDERS THAT HOLD"

IN addition to the usual and well-known economies of tool holder use in machine-shop practice, Williams' "Agrippa" Cutting-off and Side Tools offer a combination holder which answers equally well for *both* cutting-off and side work by merely changing the cutters. Evidently this provision means a material reduction in the investment in tool holders which a shop is called upon to make.

Note, if you please, that the broad edge of both Cutters is at the top. In the case of the Cutting-off blade this is necessary to provide the required clearance; and in both cases, the broad edge of the Cutter at the top provides more metal behind the cutting point, thus dissipating the heat generated by the cut as rapidly as possible to avoid injury to the Cutter.

These Holders are furnished with right-hand straight shanks and both right- and left-hand offset shanks—6 sizes each.

Tool Holders for other standard operations including Turning, Boring, Planing, Threading and Knurling.

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J. H. Williams & Co.

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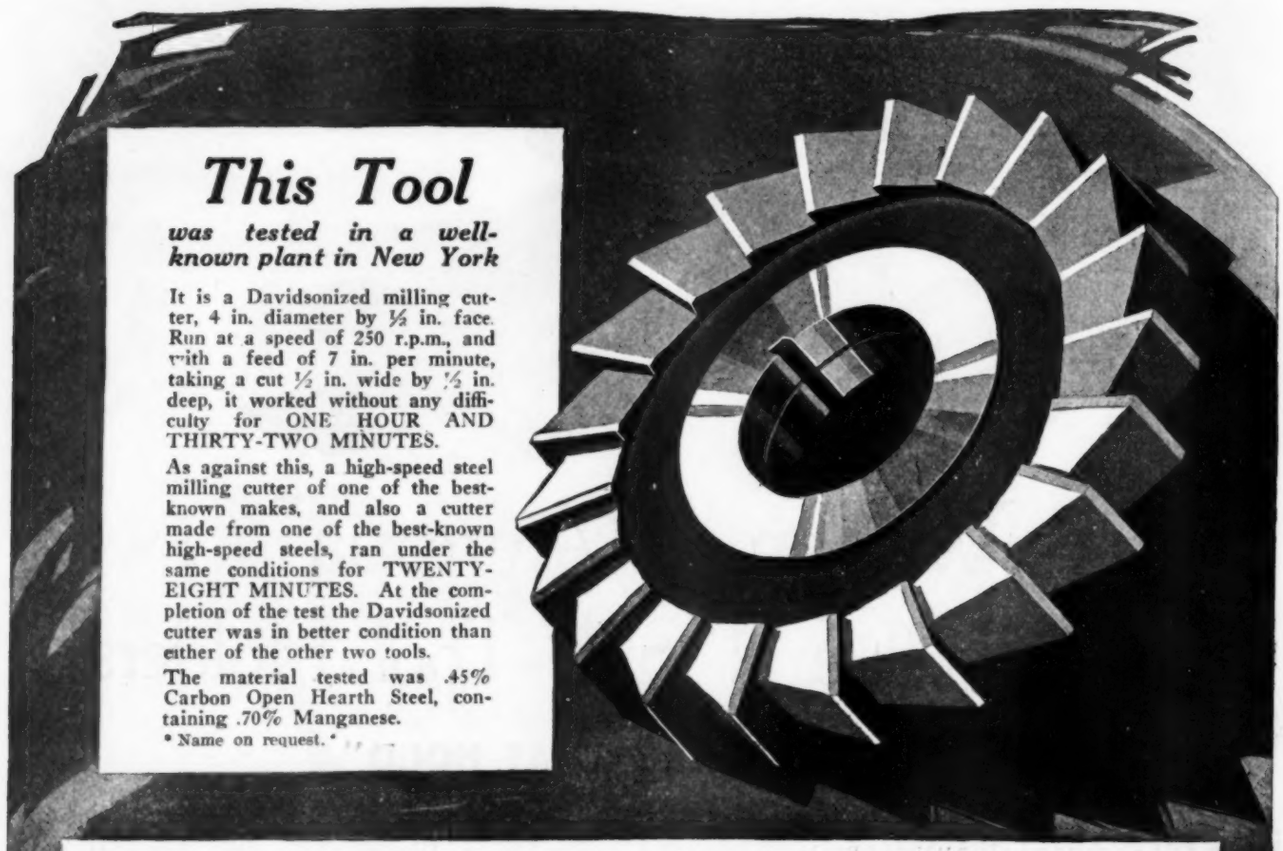

This Tool

was tested in a well-known plant in New York

It is a Davidsonized milling cutter, 4 in. diameter by ½ in. face. Run at a speed of 250 r.p.m., and with a feed of 7 in. per minute, taking a cut ½ in. wide by ½ in. deep, it worked without any difficulty for ONE HOUR AND THIRTY-TWO MINUTES.

As against this, a high-speed steel milling cutter of one of the best-known makes, and also a cutter made from one of the best-known high-speed steels, ran under the same conditions for TWENTY-EIGHT MINUTES. At the completion of the test the Davidsonized cutter was in better condition than either of the other two tools.

The material tested was .45% Carbon Open Hearth Steel, containing .70% Manganese.

* Name on request. *

You Can't Get Away From Facts Like These

We claim that it is possible in a majority of instances to obtain results similar to the above.

Davidsonized High Speed Steel

offers you great opportunities for increased production, long service and tool making economy.

We guarantee *any* tool of Davidsonized High Speed Steel to give you at least 10% better service than any other tool you have been using on corresponding work. You will be the sole judge.

More and more of the leading machine shops are turning to this steel of remarkable service, because—

1. **It increases production 10% or more. Such an increase, figuring factory overhead and labor, multiplies several times over the value of the tool.**
2. **The guarantee above gives absolute protection.**
3. **Davidson Special Service cuts tool-making time and tool-room costs.**

Special Service

We will supply Davidsonized Tools, semi-finished and easier to machine than any carbon tool steel, within approximately 1/64 of finish on face, 1/64 in bore and 1/32 in diameter, leaving only the final hardening and sharpening to be done in your tool room. A tool that takes 20 hours to make from the solid bar can easily be finished from a Davidsonized blank in about 2 hours. And we will guarantee our tools against breakage in hardening.

This service, though it applies also to standard tools, is especially desirable in the case of *tools made to unusual shapes* and other specifications.

Use this special service. It costs you less than to bring your tools from the bar to the stage at which we furnish them. It eliminates the loss by breakage in hardening. And, most important of all, it gives you better tools than you have been using, tools capable of such performances as the one described above, tools that will boost your production and give you longer service. Send us a trial order; our guarantee prevents all risk. Correspondence invited.

The Davidson Tool Mfg. Corporation

Main Office: **118-122 Maiden Lane, New York** ***Works:*** **56-62 North 6th St., Brooklyn, N. Y.**

NATIONAL-CLEVELAND

A Monthly Stock List

issued by us will facilitate your work of keeping your machines s u p p l i e d with Cutters that can be relied on for results.

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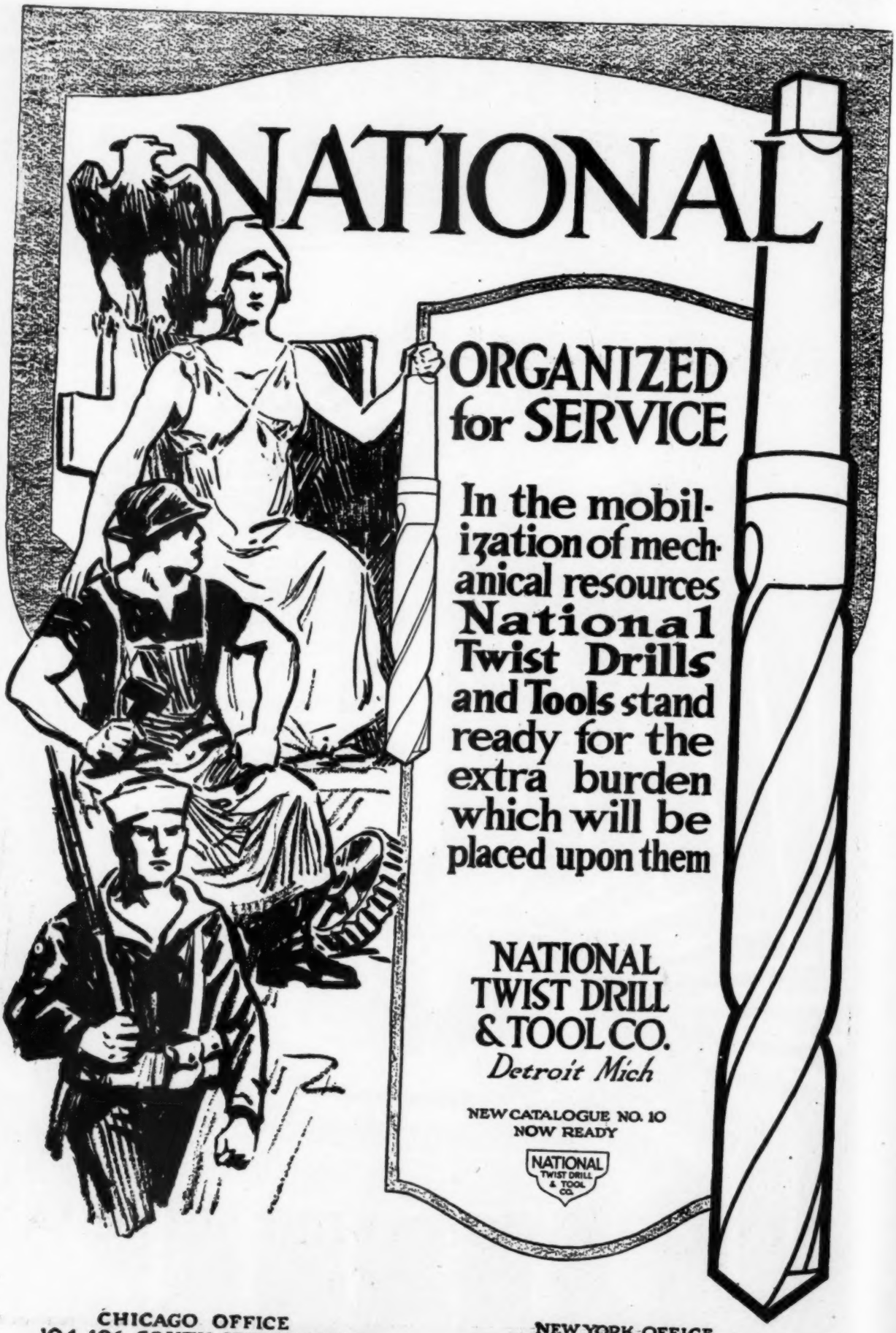
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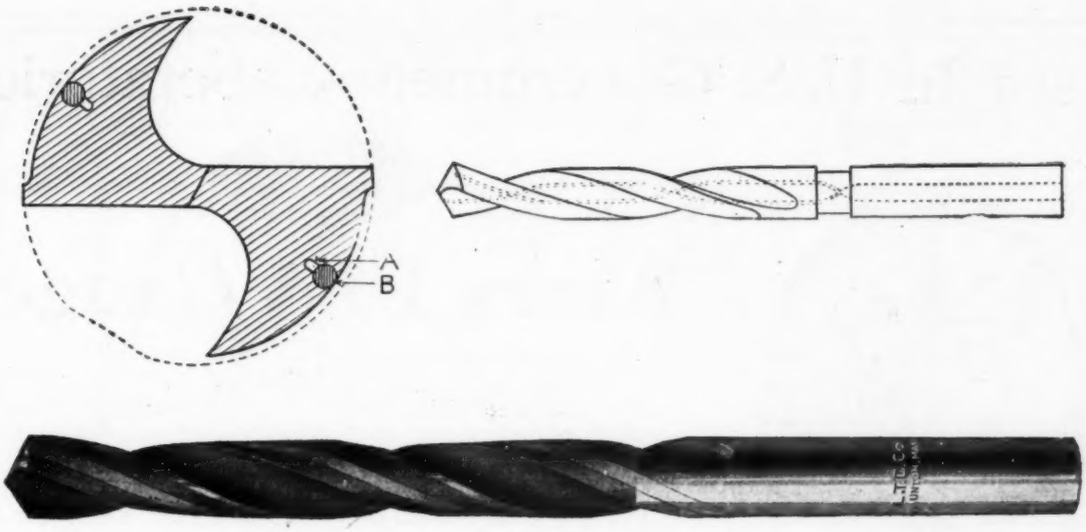

Here's the trouble-proof design of The LINCOLN OIL DRILL

No loosening, binding or breaking of the tubes in this oil drill. The Lincoln design eliminates all this trouble.

The Lincoln oil channel is formed by a groove "A" milled in the blade of the drill and a piece of drill rod "B" dovetailed into "A." Thus, for all practical purposes, you get a solid oil drill.

Send for the details as shown in catalog No. 10A. Our guarantee is with every drill.

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Ames Dial Gauges

are indispensable to manufacturers of instruments and other articles where exact duplication of parts is absolutely necessary.

When provided with a properly devised mount they form the quickest as well as the most accurate means for determining whether the work is off size or not. Instantaneously indicate extent of error, either plus or minus.

The spindle has travel of about 3/10 of an inch. The dial reads to 1/1000 of an inch and may be set in any desired position by turning knurled ring on outside of case.

Ames Dial Gauges are used by the U. S. Government, Instrument Makers, Manufacturers of Ball Bearings, Technical Schools and in machine shops of all kinds.

Write for our new catalog and details.

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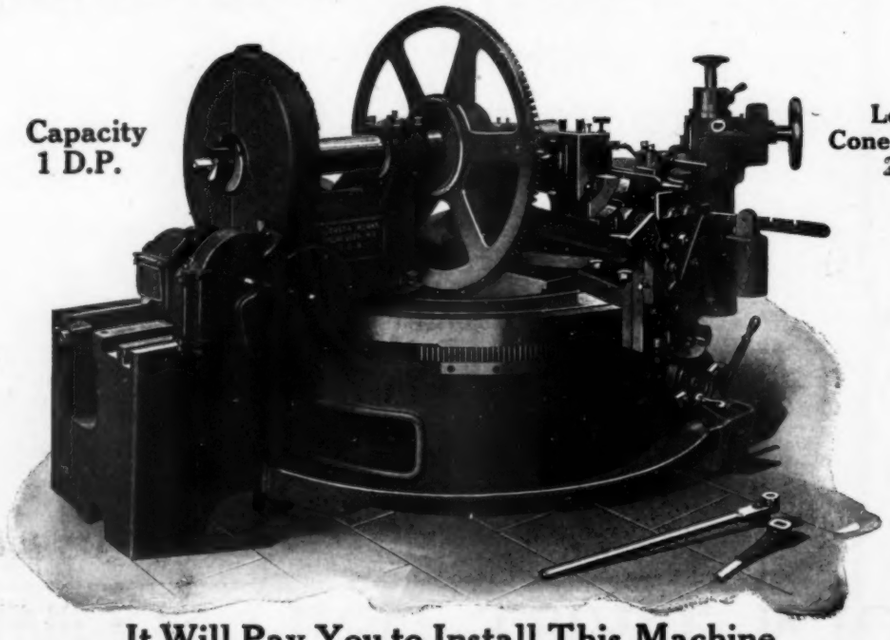
Manufacturers of Bench Lathes, Bench Milling Machines and Dial Gauges

37-in. Gleason Bevel Gear Planer

Capacity 1 D.P.

Longest Cone Distance 26 in.



It Will Pay You to Install This Machine

Automatic—Accurate—Suitable for Small Lots

GLEASON WORKS, ROCHESTER, N. Y.

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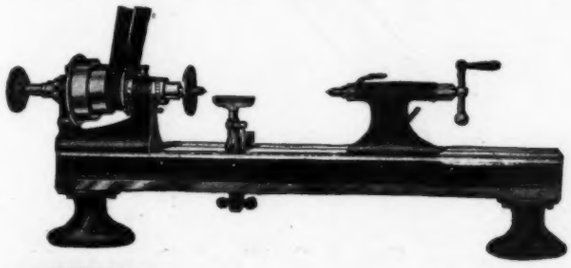
This combined Milling and Grinding Fixture cuts down costs on all small work where extreme accuracy is imperative.

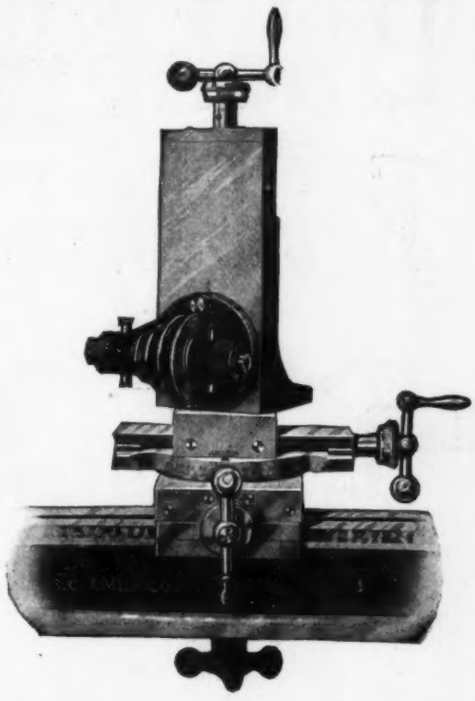
The fixture is bolted on top of the standard slide rest of

The Ames
Precision Bench Lathe

and can be placed in any desired position. The vertical slide has a micrometer adjustment. The head has a graduated swivel base and is run from a grinding counter overhead with round belt. The hollow spindle is tapered at one end to receive arbors, drills, mills, etc.

Ames Precision Lathes are guaranteed for extreme accuracy, strength and service. They are indispensable for tool room and fine instrument work.





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Manufacturers of Bench Lathes, Bench Milling Machines and Dial Gauges

Let the "Standard" reduce those odd job costs

That mass of drilling work when the casting is perhaps out of the way—not easily moved to the tool. Then take the tool to the job. It means quicker work and no time lost in moving the piece. It means less lost motion. One big way of increasing production—lowering costs.

Ball Bearing

PEDESTAL GRINDER

The "Standard" Universal Portable Electric Drill

is the tool for such work. Easily portable to the job. And when on the job it works efficiently—without fear of breakage or burn outs. High powered, force ventilated, it does not overheat. It is ball bearing throughout—bearings running in grease. The motor is dustproof, oilproof, waterproof. Upkeep practically eliminated. Operates on either direct or alternating current.

We had service to you in view when we built the "Standard." And you get service—that we guarantee. Details are interesting—no obligation to you. **Write us now.**

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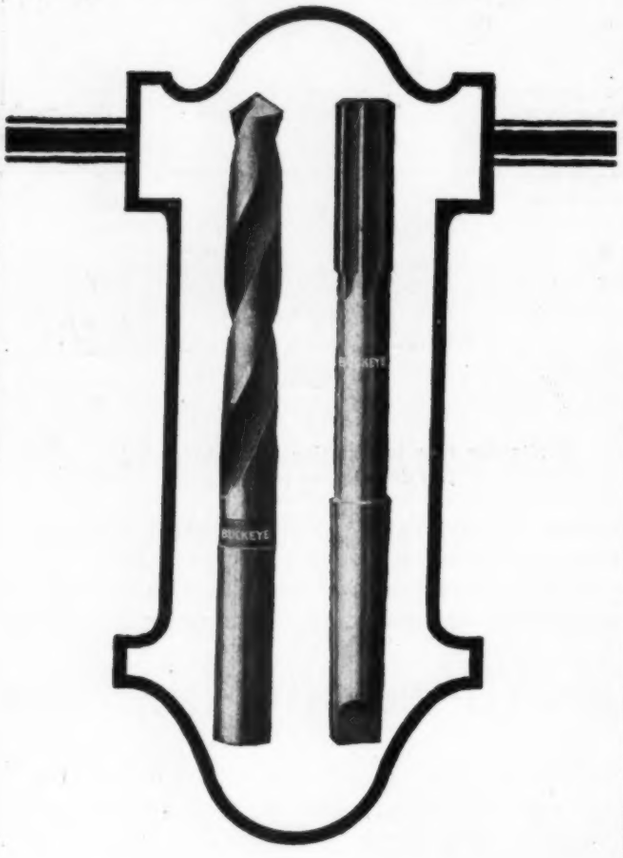
THE STANDARD ELECTRIC TOOL CO.

CINCINNATI, OHIO, U. S. A.

Buckeye Twist Drills



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install this die for accurate threads at a fast rate of production.

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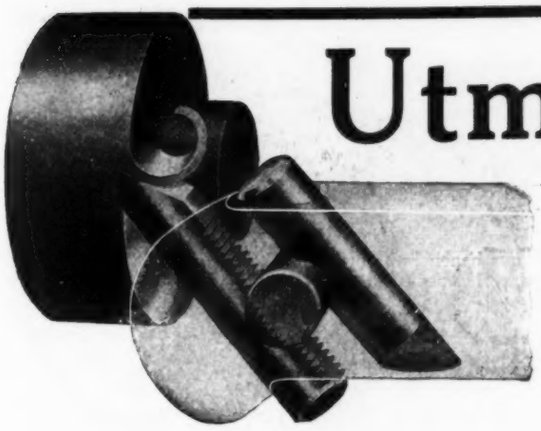

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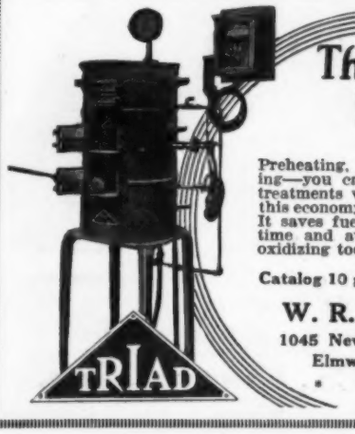

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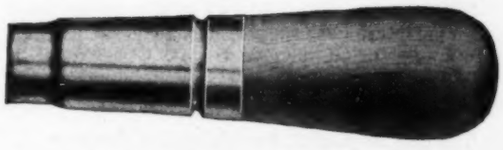

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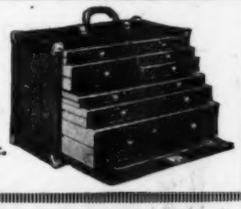

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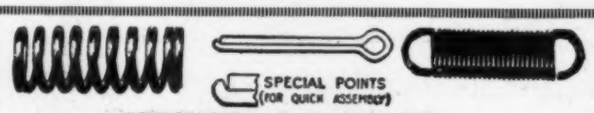

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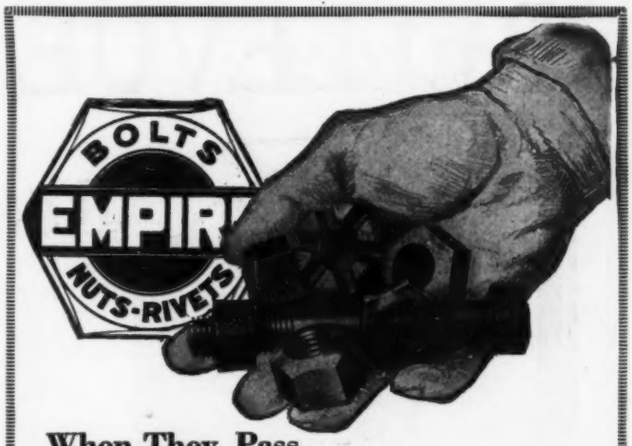

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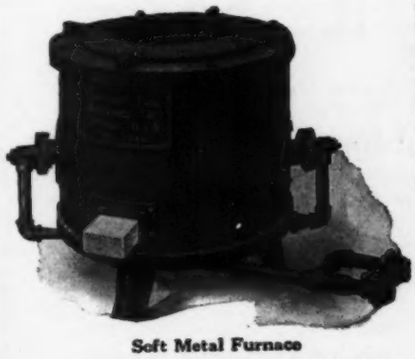

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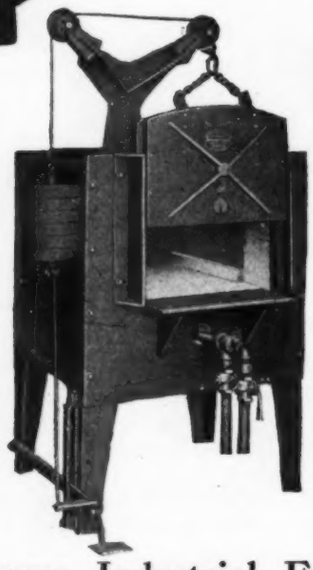

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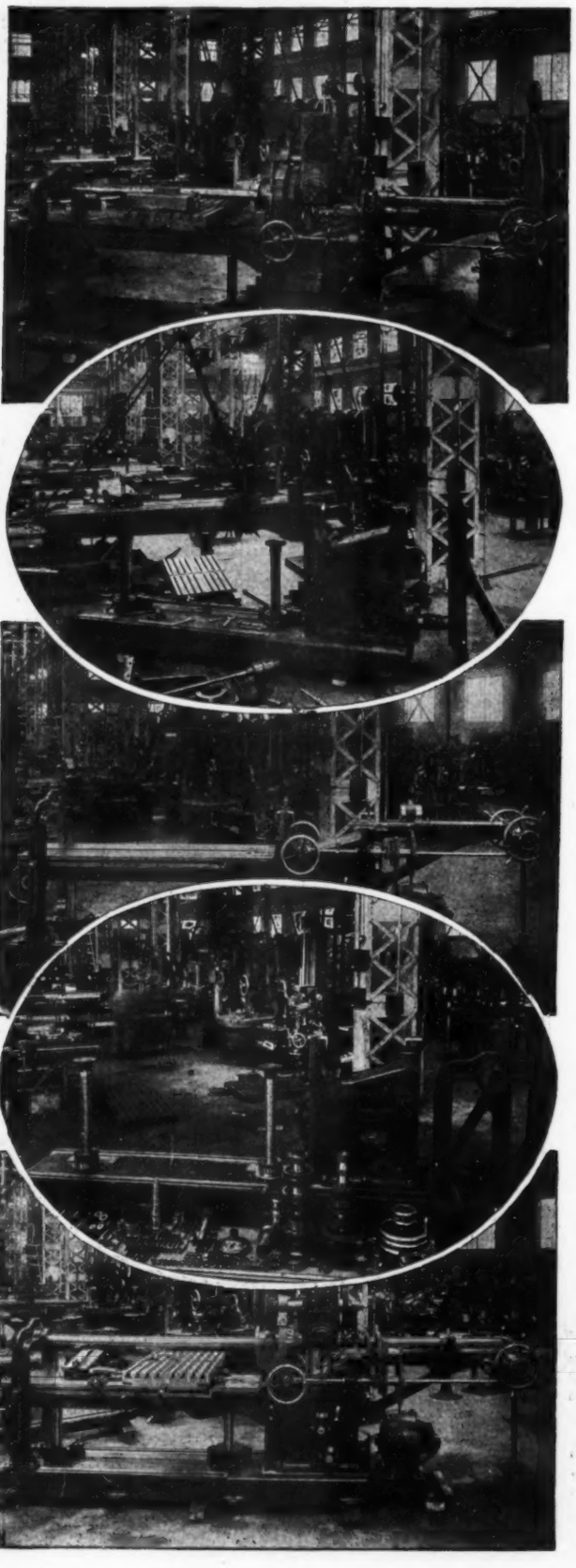

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GEAR CUTTERS

1—11-in. Gleason Generator.
1—No. 2 Robey-Smith Bevel Planer.
1—No. 1 Robey-Smith Bevel Planer.

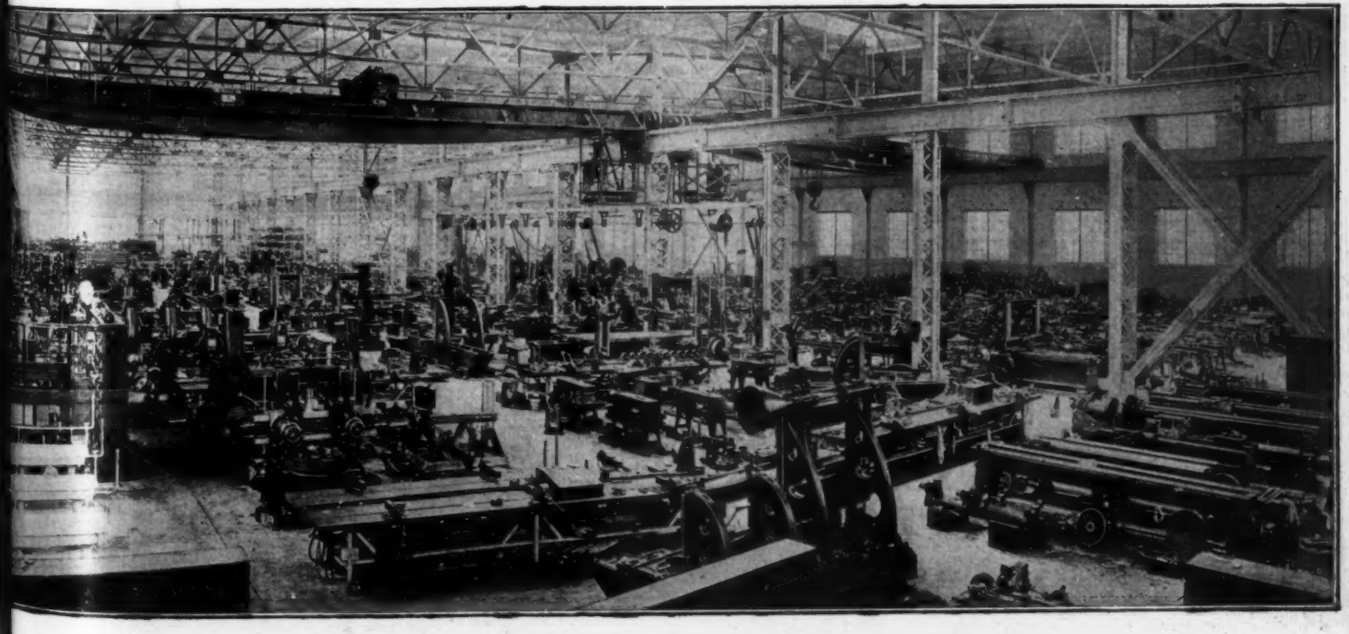
GRINDERS

1—Wells Cutter Reamer.
1—No. 1½ Landis Internal.
1—4-in. x 20-in. Morse.
1—6-in. x 30-in. Norton Plain.
5—12-in. x 24-in. Modern Plain

MISCELLANEOUS

1—No. 3 LaPointe Broaching Mch.
1—7½-in. Nutter-Barnes Cold Saw.

OUR GUARANTEE: YOUR MONEY BACK IF YOU RETURN MACHINE WITHIN 30 DAYS OF DATE OF SHIPMENT, FREIGHT PREPAID NO EXCUSES NECESSARY!



Special Offerings in New and Used
Machine Shop Equipment

ENGINE LATHES

2—New 11 in. x 5 ft. Star Engine Lathes
1—New 11 in. x 5 ft. Worcester Engine Lathe
2—New 12 in. x 5 ft. Vernon Engine Lathes
1—New 14 in. x 6 ft. Reed-Prentice Geared Head Engine Lathe
1—New 14 in. x 6 ft. Monarch Engine Lathe
1—New 14 in. x 6 ft. Rockford Engine Lathe
2—New 14 in. x 6 ft. Filsmith Engine Lathes, QCG.
2—New 16 in. x 6 ft. Filsmith Engine Lathes, QCG
1—New 16 in. x 8 ft. Filsmith Gap Lathe, QCG
1—New 18 in. x 8 ft. Walcott Engine Lathe, QCG
3—New 18 in. x 8 ft. Rockford Engine Lathes, QCG
4—New 18 in. x 8 ft. Perkins Engine Lathes
1—New 20 in. x 10 ft. Perkins Engine Lathe
1—New 20 in. x 10 ft. Reed Engine Lathe

DRILLS

4—New 14 in. Excelsior Sensitive Drills
3—New 14 in. No. 20 Stanley Sensitive Drills
14—New 20 in. Wheel and Lever Feed Upright Drills
13—New 20 in. Power Feed Back Geared Upright Drills
1—New No. 2 Langelier B. B. Upright Drill
1—New 1-spindle Detroit B. B. Upright Drills
2—New 1-spindle Allen B. B. Upright Drills
2—New 1-spindle Taylor & Fenn Upright Drill
1—Used 2-spindle Henry & Wright Upright Drill
1—New 3-spindle Taylor & Fenn Upright Drill
1—New 4-spindle Taylor & Fenn Upright Drill
3—New 4-spindle Allen B. B. Upright Drills
3—New 23 in. Reed-Prentice Sta. Head Upright Drills
2—New 24 in. Hoefer Sliding Head Upright Drills
2—New 26 in. Hoefer Sliding Head Upright Drills
2—New 36-in. Reed-Prentice Standard Pattern Upright Drills
2—New 3 ft. Taylor & Fenn Sensitive Radial Drill
3—New 3 ft. Reed-Prentice Bronze Bearing Plain Radial Drills
3—New 5 ft. Reed-Prentice Bronze Bearing Plain Radial Drills
1—Used 4 ft. Gang Plain Radial Drill

GEAR CUTTERS

1—Used No. 12 B. & S. Automatic Gear Cutter, spur and bevels
3—New No. 3-A Cincinnati Automatic Gear Cutters, 36 x 10

GRINDERS

1—New Blake & Johnson Surface Grinder
2—New No. 1 Norton Universal Tool & Cutter Grinders
2—New Greenfield Universal Cutter and Reamer Grinders
1—New Draper & Hall Cutter and Reamer Grinder
1—New No. 1 Morse Plain Grinder
2—New 8 x 30 Modern Plain Grinders
1—Used No. 16 B. & S. Plain Cylindrical Grinder, 10 x 72
1—New No. 2½ Bath Universal Grinder, Equipment "C"
1—New No. 2 Reid Surface Grinder

PLANERS

1—Used 22 in. x 22 in. x 5 ft. Whitcomb Planer, one head
1—Used 24 in. x 24 in. x 6 ft. Whitcomb Planer, one hd.
3—New 24 in. x 24 in. x 6 ft. Putnam Planers, one head
1—New 36 in. x 36 in. x 12 ft. Powell Planer, two heads
1—New 60-in. x 60-in. x 24-ft. Woodward & Powell Planer, 4 heads

MILLING MACHINES

1—New 10 in. x 28 in. Bristol Vertical Milling Machine, Rotary
1—New No. 4-B Becker Vertical Milling Machine, Rotary
1—New No. 2 Van Norman Duplex Milling Machine
1—New No. 2-C Rockford Universal Milling Machine with Vertical Attachment
1—New No. 2½ Rockford All Geared Single Pulley Drive Universal Milling Machine
29—Used Becker Heavy Hand Milling Machine

PRESSES and DROPS

1—Used No. 5 Perkins Heavy S. A. Power Press
1—Used No. 30 Waterbury-Farrel Foundry S. A. Power Press
1—Used No. 4 Greenerd Arbor Press
2—New No. 4 Greenerd Arbor Presses
1—Used No. 2 Standard Broaching and Drawing Press
1—Used 200 lb. Standard Plain Drop
1—Used 400 lb. Standard Automatic Drop

SHAPERS

3—New 16 in. Walcott B. G. Crank Shapers
2—New 16 in. Kelly B. G. Crank Shapers
2—New 20 in. Ohio B. G. Crank Shapers
3—New 20 in. Walcott B. G. Crank Shapers
1—New 20 in. Cincinnati B. G. Crank Shaper
2—New 20 in. Kelly B. G. Crank Shapers
2—New 24 in. Walcott B. G. Crank Shapers
1—Used 18 in. Ohio Crank Shaper

SCREW MACHINES and TURRET LATHES

1—Used 2 in. x 24 in. Jones & Lamson Flat Turret Lathe
3—Used 21 in. Gisholt Turret Lathes
1—Used Conradson Turret Lathe
1—Used Garvin Automatic Chucking Machine, hex. turret
11—Used Garvin No. 22 Monitor Turret Lathes with air chucks
1—Used 2½ in. Cleveland Automatic Screw Machine
1—Used B. & S. Automatic Chucking Machine

COMPRESSORS, PUMPS, ENGINES

2—Used Hall Steam Driven Air Compressors 10 x 13½ x 10in.
2—Used Hall Steam Driven Air Compressors 14 x 20½ x 14in.
1—Used Knowles Duplex Steam Pump 6 x 8½ x 6 in.
1—Used Knowles Duplex Steam Pump 10 x 8½ x 10 in.
1—Used Armington & Sims Engine 9½ x 10 in.
2—Used No. 8 Garden City Double Belted Blowers

MISCELLANEOUS

1—Used 6 in. Hurlbut & Rogers Accelerated Speed Type Cutting-off Machine
1—Used 11 in. Putnam Slotter
3—Used Small Rolling Mills 3 in. x 5 in.
21—New 6 x 6 Peerless Hack Saws
1—Used 36-in. Bullard Vertical Boring and Turning Mill, two swivel heads

BROWNELL
MACHINERY CO.
PROVIDENCE, R. I.

Biggest Best

The Machinery Exposition of U.S.A.

MILLING MACHINES

Two (2) Newton (heavy type), vertical, heavy duty, heavy facing cutter heads 36-in. dia., good as new.
No. 3 Hendey Plain, back geared.
No. 2 Hendey Plain, back geared.
No. 2½ Garvin Universal.

SHAPERS

28-in. Hendey, box table and vise.
28-in. Smith & Mills, box table and vise.
24-in. Potter & Johnson, back geared, crank, universal table.
24-in. Hendey, box table and vise.
24-in. Juengst, back geared, crank, box table and vise.
15-in. Hendey, box table and vise.
10-in. Gould & Eberhardt, back geared, crank, box table and vise.

LATHES

52-in. x 22-ft. Wood Light, triple geared, face plate drive.
50-in. x 20-ft. Pond, triple geared, face plate drive.
38-in. x 14-ft. Fay & Scott, heavy duty, 3-in. hole in spindle.
30-in. x 12-ft. Israel Johnson, heavy duty, triple geared, face plate drive.
28in. x 12-ft. Fay & Scott.
20-in. x 8-ft. Lodge & Shipley, geared head, single pulley drive.

HAMMERS

250-ton Mesta Steam Hydraulic Quick Acting Forging Press, single frame type, weighs 50,000 lb.
1500-lb. Bliss board drop
1500-lb. United Engr. Co.'s board drop.
500-lb. Mossberg automatic drop, strap type.

HORIZONTAL BORING MILLS

No. 2 Barrett Cylinder Boring, 5-in. bar.
3-in. Industrial, knee type.
3-in. Rochester, floor type.

PUNCHES AND SHEARS

No. 7 Hilles & Jones Multiple Punch, approximate weight 50,000 lb., easily converted to shear.
No. 61 Thomas Carlins Alligator Shear, 30-in. shear blades, capacity 5-in. round.
Betts Punch, depth of gap 20-in., capacity 1-in. thru 1-in.
19-in. Gap Cleveland Punch, capacity ⅝-in. x ⅜-in.
No. 2 Royersford Combination Punch and Shear.
Newbold Rot. Splitting Shear, capacity ¾-in., throat 28-in., circular cutting attachment.

GEAR CUTTERS

48-in. Gould & Eberhardt, spur.
36-in. Gould & Eberhardt, spur and bevel.
Two (2) No. 3 Fellows Gear Shapers, 24-in. cap.

VERTICAL BORING MILLS

14-ft. Standard, 2 swivel heads.
10-ft. Hilles & Jones, single swivel head.
90-in. Pond, 2 swivel heads.
52-in. Bridgeport Bullard, 2 swivel heads.
36-in. Baush, 2 swivel heads.
36-in. Bullard, 2 swivel heads.
30-in. Bullard, single turret head.

RADIAL DRILLS

6-ft. Baush, box table.
6-ft. Bickford, box table.
5-ft. Baush, motor driven.
5½-ft. Niles, semi-universal.
3½-ft. Gang, tapping box table.

POWER PRESSES— DOUBLE ACTION

No. 512 Bliss, 33 tons working pressure.
Two (2) No. 3½-A Bliss Toggle Drawing, approximate weight 16,200 lb.
Two (2) No. DD-4 Ferracute, throat 9-in., approximate weight 6,000 lb.
Two (2) No. 3½ Farrell, geared toggle, 4-in. stroke.

PRESSES—SINGLE ACTION

Six (6) No. 540 Max Ams, geared, 8-in. stroke, weight 5,600 lb.
Six (6) No. 6 Farrell, straight side, geared.
Two (2) No. 6 Farrell, geared, 5-in. stroke.
No. 5 Farrell, geared, 8-in. stroke.

PLANERS

60-in. x 48-in. x 20-ft. Gleason, 2 swivel heads on cross rail, one side head.
48-in. x 36-in. x 16-ft. Detrick & Harvey, open side, 3 heads.
48-in. x 36-in. x 13-ft. Detrick & Harvey, open side, 3 heads.
48-in. x 36-in. x 10-ft. Ohio, 2 heads.
36-in. x 36-in. x 14-ft. Cincinnati, 2 heads.
30-in. x 30-in. x 14-ft. Flather, 2 heads.

NOTE—We have just purchased sixty (60) presses—almost new—single and double acting, forming and blanking. Send for full particulars.

The above are merely selections at random from over five hundred (500) machines at our warehouse, ready for immediate delivery.

GRAVES MACHINERY EXCHANGE

Warehouse and R.R. Sidings:
Johnson Ave. and Monitor St., Jersey City, N. J.

Offices:
Suite 482, 50 Church Street, New York City, N. Y.

Telephone, Cortlandt 665

NEW HIGH SPEED DRILLS

CLEVELAND TWIST DRILL CO. (Maker)

STRAIGHT SHANK—NO. 415—R.H.

36	....	3/16
5	....	5/16
9	....	11/32
174	....	7/16
24	....	31/64
33	....	21/32
17	....	43/64
4	....	11/16
12	....	13/16
12	....	29/32
4	....	59/64
6	....	57/64

STRAIGHT SHANK—NO. 417—R.H

40		¼
23		5/16
17	12	1 17/64
7	12	1 23/64
1	12	1 13/16
1	12	1 51/64

STRAIGHT SHANK—NO. 415—L.H.

8	....	3/16
200	....	7/32
15	....	9/32
12	....	9/16
5	....	31/64
4	....	15/16
13	....	39/64
14	....	47/64
2	12	1 3/32

STRAIGHT SHANK—NO. 417—L.H.

70	....	¼

LETTER SIZE

60	....	"P"

STRAIGHT SHANK, 3 FLUTE NO. 409—R.H.

19	....	11/16
1	....	31/32
31	....	59/64
160	....	1 3/64
2	....	1 1/16-.005

OIL TUBE—NO. 429—R.H.

5	9	47/64
20	9	53/64
45	9	55/64
10	12	29/32
2	12	1 11/64
11	12	1 3/16
113	....	1 15/64
1	9½	1 5/16
8	12	1 5/16
5	....	1 27/64
3	12	1 15/32
2	12	1 35/64
6	12	1 15/16
14	12½ O.A.	2 1/16

OIL TUBE—NO. 429—L.H.

11	9	23/32

WIRE GAUGE

180	....	4
108	....	10
279	....	11
30	....	12
18	....	14
12	....	15
6	....	17
6	....	18
18	....	19
84	....	20
6	....	26
6	....	45
18	....	60

MILLIMETER SIZE

350	....	4.9 mm
7	....	5.1 mm

STRAIGHT SHANK—LETTER SIZE

10	....	N
236	....	O
945	....	P
11	....	Q

TAPER SHANK—NO. 403—R. H.

60	(Shank larger than reg.)		29/32
1	15	O.A.	1⅛
10	15	O.A.	1 19/32
4	16	O.A.	1 39/64
1	17	O.A.	1 15/16
3	17	O.A.	1 31/32

TAPER SHANK—NO. 403—R.H. (Perfect Double Tang)

2	.....	11/16

LETTER SIZE

(TAPER SHANK—NO. 403—R.H.)

141	....	"N"

(WIRE GAUGE—TAPER SHANK—NO. 403—R.H.)

38	....	No. 4

LATROBE TOOL CO. (Maker)

TAPER SHANK R.H. HIGH-SPEED DRILLS

1	13½	O.A.	1 9/64

WHITMAN & BARNES (Maker) Wire Gauge

12	....	No. 5

NATIONAL TWIST DRILL CO. (Maker) Straight Shank

48	Short Set	11/64
57	.....	9/64
6	Short Set	11/64

FORGING STEEL—
Regular Merchant Bars

20,000	1¼ x 9/16 Flat	15/25
48,038	¾ Rd	15/25
70,000	2¾ x ⅞ Flat	35/45
30,000	3 x ¾ Flat	35/45
8,400	1⅛ Rd	35/45
140,000	2 Rd	35/45
100,000	2½ Rd	35/45
200,000	1 ½ Sq.	35/45
729,857	1⅝ Sq.	35/45
500,000	1¾ Sq.	35/45

(Made by Carnegie Steel Co.)

COLD ROLLED STEEL

Quan. Lb.	Size, In.	Carbon
8054	2/3 Rd	15/25
10,000	13/32 Rd	15/25

(Made by Union Drawn Steel Co.)

HIGH SPEED TAPER REAMER No. 515 (R. H.)

CLEVELAND TWIST DRILL CO. (Maker)

Quantity		Size
32	Peerless Caucking	9/16
6	Peerless Chucking	⅝
32	Peerless Chucking	¾
34	Peerless Chucking	¾-.005
11	Peerless Chucking	13/16
48	Peerless Chucking	⅞
9	Peerless Chucking	15/16
34	Peerless Chucking	1-.005
3	Peerless Chucking	1 5/32
24	Peerless Chucking	1 3/16
20	Peerless Chucking	1 ¼
24	Peerless Chucking	1 ⅜
1	Peerless Chucking	2 ½
3	Expansion "	1-.270
6	Core "	1 1/32
29	Rose Chucking	.380
13	Rose Chucking	⅝
12	Fluted "	¾
1	Fluted "	1 5/32

TAPER SHANK (L. H.) No. 630

16	Fluted Chucking	⅝
16	Fluted Chucking (Spiral flute)	¾

STRAIGHT SHANK MACHINE (R. H.) No. 507

15	Peerless Chucking (Short Set)	⅝
11	Fluted Chucking No. 134	15/16

STRAIGHT SHANK MACHINE (L. H.)

5	4 in.	7/16

HAND REAMERS (R.H.) No. 501

CLEVELAND TWIST DRILL CO. (Maker)

Quantity		Size
125	Peerless	1 1/16
3	Peerless	1 11/16

TAPER SHANK EXPANSION CORE (R. H.) No. 518

30	Peerless Expansion Core	1
18	Peerless Expansion Core	1 1/32
7	Peerless Expansion Core	1 1/16
4	Peerless Expansion Core	1 3/16
30	Peerless Expansion Core	1¼
6	Peerless Expansion Core	1 5/16
49	Peerless Expansion Core	1⅜
48	Peerless Expansion Core	1⅜-.005
12	Peerless Expansion Core	1½
7	Peerless Expansion Core	1⅝
6	Peerless Expansion Core	2
4	Peerless Expansion Core	2¼
6	Peerless Expansion Core	2½
4	Peerless Expansion Core	2 1/16
6	Peerless Expansion Core	2¼
2	Peerless Expansion Core	3.135
4	Peerless Expansion Core	3 3/16

STRAIGHT SHANK (R.H.) No. 510

1	Peerless Expansion Core	2½

NEW CARBON REAMERS

CLEVELAND TWIST DRILL CO. (Makers)

TAPER SHANK (R.H.) 134-A

6	Fluted Chucking	5/16

STRAIGHT SHANK (R.H.) No. 129

1	Expansion (Common Sense)	1½

HAND REAMERS (R.H.) No. 128-A

13	Hand Reamers	5/16
7	Hand Reamers	⅜
20	Hand Reamers	9/16
21	Hand Reamers	13/16
16	Hand Reamers	15/16
37	Hand Reamers	1
14	Hand Reamers	1 3/16
6	Hand Reamers	1¼
5	Hand Reamers	1 5/32
20	Hand Reamers	1½
4	Hand Reamers	2½

TAPER PIN REAMERS (R.H.) No. 137

CLEVELAND TWIST DRILL CO. (Maker)

6	Taper ¼ in. to the foot		0
6	Taper ¼ in. to the foot		1
6	Taper ¼ in. to the foot		2
6	Taper ¼ in. to the foot		3
4	Taper ¼ in. to the foot		6
6	Taper ¼ in. to the foot		7
12	Taper ¼ in. to the foot		8

SHELL REAMERS (R.H.) No. 301

CLEVELAND TWIST DRILL CO (Maker)

4	Paradox Adjustable	2½
3	Paradox Adjustable	3

FLUTED SHELL (R.H.) No. 130-A

1	Fluted Shell	1½
2	Sets Adj. Blades for Paradox Reamers. (8 to A Set.)	3

MORSE TWIST DRILL CO. (Maker) No. 625

3	Shell Reamers	1½

DRIFTS OR CENTER KEYS No. 105

CLEVELAND TWIST DRILL CO. (Maker)

11	No. 4	

GRINDING WHEELS

NORTON CO. (Maker)

15	Buffing (large)	
3500	½ x ½ x ½ Shape W 22	Grain 38120 Grade K
50	2½ x ½ x ½	Grain 3846 Grade J
2000	3 x 1/16 x ½	Grain 46 Grade 2½
75	3 x ½ x ½	Grain 3846 Grade J
200	3½ x 1½ x ½ Shape Coin No. 2	Grain 3846 Grade 2
1000	6 x 11/16 x ½ (dish) Coin No. 3	Grain 46 Grade 1½
350	6 x 2 x ½ Coin No. 14	Grain 46 Grade 1½
300	½ Round Emery Pencils	

FILES

MURCOTT & CAMPBELL (Maker)

312	Flat Bastard	8 in.
334	Flat Bastard	10 in.
180	Flat Bastard	12 in.
23	Flat Smooth	6 in.
240	Square Bastard	8 in.
204	Square Bastard	10 in.
180	Square Bastard	12 in.
144	Square Smooth	8 in.
96	½-round Bastard	8 in.
48	½-round Bastard	10 in.
192	½-round Bastard	14 in.
120	½-round, 2nd Cut	8 in.
12	Round Bastard	8 in.
168	Round Bastard	10 in.
288	Round Bastard	12 in.
240	Round Bastard	14 in.
60	Round, 2nd Cut	4 in.
120	Round, 2nd Cut	6 in.
24	No. 0, 2nd Cut (Pippin)	6 in.
24	Smooth Warding	6 in.

DISSTON CO.

60	Square Bastard	12 in.

FAIRBANKS CO.

756	½ round Bastard	10 in.
480	½ round Smooth	6 in.
120	Round Smooth	6 in.

KEARNEY & FOOTE CO.

132	Round Bastard	6 in.
132	Round Bastard	8 in.

HELLER BROS CO.

11	2nd Cut, Warding	6 in.
143	3-Sq. Bastard	5 in.
120	3-Sq. Bastard	8 in.
8	Vixen Milling File Holders	
1000	No. 1 File Handles	
300	No. 4 File Handles	
400	No. 5 File Handles	
60	Hammer Handles	12 in.

SPICER MFG. CORPORATION, South Plainfield, N. J.

It's yours every month—this 3 in 1 combination

1. Renewed Stock List
2. Recent Photo of the Boys "Over There"
3. Calendar

NEW YORK'S GREATEST STOCK
What Have You to Sell? Tell Us
List of New and Rebuilt Machine Tools
December
NEW YORK MACHINERY EXCHANGE

Of course you want his list on your desk by the first of each month. It keeps you posted on all the latest and most important buys obtainable at the largest machinery exchange in the east. You'll have a list of machines guaranteed to render maximum service—machines thoroughly renewed, to give you far more than a full measure of service.

To add to the list you get a recent photo of "our boys" over there, plus a calendar for the month. It makes an attractive combination.

You can depend upon it that every lathe, every shaper, every boring mill, every drill press, every gear cutter, every drop hammer that you find on the list will have built into it new power, new accuracy, new endurance ahead of ordinary standards.

Make no mistake about it. This list will prove valuable to you. Don't hesitate. Put your name down now on the coupon and mail it today.

Our Guarantee

If this machine is not as represented, return it in 30 days—freight prepaid.

New York Machinery Exchange

50 Church Street, New York City

Machine Shops and Warehouses

To New York Machinery Exchange,
50 Church St., New York City.
Kindly put my name down as a subscriber to your current stock list.

Name.....
Position.....
Company.....
Address.....

1876 THE MACHINERY HOUSE OF THE EAST FRANK TOOMEY, Inc. 1918

MACHINE TOOLS

LATHES
10 in. x 4 ft. Prentice, H.S., C.R.
13 in. x 7 ft. 6 in. New Carroll-Jamieson, plain change
14 in. x 6 ft. New Carroll-Jamieson Q.C.
14 in. x 6 ft. Canedy-Otto, New
15 in. x 6 ft. New Sidney Q.C., swings 17 in.
16 in. x 8 ft. Hendey Q.C., taper attachment
16 in. x 8 ft. Canedy-Otto, New
16 in. x 24 ft. New Rahn Larmon, D.B.G., Q.C.
17 in. x 8 ft. New National C.R., Q.C.
17 in. x 8 ft. New Sidney Q.C., swings 19 in.
18-in. x 8-ft. Canedy-Otto, new.
19-in. x 8-ft. New Sidney, Q.C., swings 21 in.
20-in. x 12-ft. Hendey, Q.C., taper attachment.
25-in. x 16-ft. New Sidney, Q.C., swings 27 in.
28-48-in. x 14-ft. Harrington Extension.
33-in. x 12-ft. Putnam T. G. Motor.

TURRET LATHES
2 x 24-in. J. & L., cone head, complete.
24-in. Davis Chucking.
No. 1 Bardon & Oliver Screw.

VERTICAL BORING MILLS
60-in. Bullard, two heads.
64-in. Niles, two heads.

PLANERS
36 x 36-in. x 8-ft. Gray, two heads.
30 x 27-in. x 8-ft. Smith, one head.
27 x 23-in. x 6-ft. Smith, one head.
18 x 8-in. x 3-ft. Wheeler, one head.

SHAPERS
16-in. New Steptoe, B.G.
20-in. New Steptoe, B.G.
24-in. New Steptoe, B.G.
16-in. Bement Travel Head.
16-in. Barker Travel Head.

MILLERS
No. 4 Brown & Sharpe Plain.
No. 3 Cincinnati Universal.
No. 3 Kempsmith Universal, new.
No. 1½ New American Plain.
No. 0 Steptoe Hand, new.
No. 2 Burke Bench, P. F.

GRINDERS
No. 1 Fraser, Universal, new.
No. 1 Landis.
No. 6 Coates, new universal Cutter and Reamer.
No. 1 and 2 Grand Rapids New Cutter and Reamer.
No. 190 Wells.

RADIAL DRILLS
6-ft. Western Univ. Motor.

Radial Drills (Continued)
42-in. New Plain Canedy-Otto.
48-in. Mueller Plain.
60-in. Bickford Plain.

DRILL PRESSES
D-2 Colburn Compound Table.
No. 310 Baker Hi-Speed.
No. 315 Baker Hi-Speed.
14-in. New U. S. Sensitive.
16-in. New C. O. Sensitive.
No. 23 New Demco Sensitive.
16-in. New Kokomo Hi-Speed.
20-in. New Kokomo 4-spindle.
20-in. Superior B.G., P.F., new.
20-in. C.-O., B.G., P.F., new.
24-in. Superior, B.G., P.F., new.
25-in. Superior, S. H., new.
28-in. Superior, S. H., new.
32-in. Superior, S. H., new.
36-in. Superior, S. H., new.
36-in. Bement Goose Neck.

GEAR CUTTERS
No. 6 Fellows Gear Shaper.
36 G. & E. Automatic.
24-in. G. E. Automatic.
No. 14 Whiton, 36 in.

HAMMERS
400-lb. Sellers Steam.
250-lb. New Little Giant.
100-lb. New Little Giant.
50-lb. New Little Giant.
25-lb. New Little Giant.

PRESSES
No. 130 Max Ams, new.
No. 126-A Max Ams, new.
No. 121 Max Ams, new.

PUNCHES AND SHEARS
No. 53 Beloit, new Punch and Shear.
No. 9-B Beloit, new Punch and Shear.
20-in. throat Ridgeway Geared Single End Punch, 1¼ in. in 1 in.

METAL SAWS
Napier 10 x 10 Band.
Napier 13 x 16-in. Hi-Speed.
Napier 9 x 9 Hi-Speed.
Napier 6 x 6 Hi-Speed.
Economy No. 3 Hi-Speed.
Espen-Lucas 14-in. Saw, bar, circular.

STEAM AND ELECTRICAL EQUIPMENT.

WATER TUBE BOILERS
1—250-hp. Babcock & Wilcox Water Tube Boiler, 150-lb. steam working pressure.
2—75-hp. Stirling Water Tube Boilers, 150-lb. steam working pressure.

PORTABLE RETURN TUBULAR BOILERS
100-hp. Erie City Iron Works, economic 125-lb. steam pressure, with 60 ft. of 30-in. diameter stack.
80-hp. Erie City Iron Works, Economic 100-lb. steam pressure.
50-hp. Pennsylvania Iron Works, Marine type, 100 lb. steam pressure.

DIRECT CONNECTED UNITS, 220-250-Volts
100-kw. Crocker-Wheeler, 250-volt, 8-pole compound wound Generator, direct connected to a 14 x 21-in. Hamilton horizontal Corliss Engine, 150-r.p.m.

DIRECT CONNECTED UNITS, 110-125-Volt
100-kw. General Electric, 125-volt, comound wound Generator, direct connected to a Ball & Wood horizontal compound Automatic Engine, 250-r.p.m.
50-kw. Bullock, compound wound Generator, direct connected to an Erie City Iron Works horizontal Automatic Engine, 290-r.p.m.

AIR COMPRESSORS
We have recently purchased the entire Compressor stock of the Nagle-Corliss Engine Works, Erie, Pa., manufacturers of high-grade Compressors. We can offer the following machines with the usual factory guarantee complete with their regular equipment, and available for immediate shipment:

BELT DRIVEN
1—20-12 x 12 enclosed type, 872-cu.ft. capacity.
2—10 x 10, class "AE" enclosed, 240-cu.ft. capacity.
1—10 x 10, class "A" enclosed, 204-cu.ft. capacity.
1—8 x 8, type "A" open, 116-cu.ft. capacity.

STEAM DRIVEN
1—10 x 10 x 10, class "B" enclosed type, 240-cu.ft. capacity
2—8 x 10 x 8, class "BE" enclosed type, 181-cu.ft. capacity.
1—8 x 9 x 8 class "B" enclosed type, 147-cu.ft. capacity.
1—8 x 8 x 8, class "B", enclosed type, 116-cu.ft. capacity.
1—6 x 6 x 6, class "B", enclosed type, 59-cu.ft. capacity.

Send for Complete Stock List, just issued

FRANK TOOMEY, Inc., 127-131 N. Third St., Philadelphia, Pa.

BAIRD Good Tools for Immediate Delivery DETROIT

LATHES
1—10-in. x 4-ft. Myers Standard Change Gear Engine Lathe, compound rest, countershaft, regular equipment, swing 10 in. over carriage, 24 in. between centers. New.
1—New 14-in. x 6-ft. bed Filsmith Engine Lathe. New.
6—New Tyee B-4, 6 x 30-in. Dalton Bench Lathe. New.
6—New Type B-4, 6 x 36-in. Dalton Bench Lathe, with taper attachment, draw-in attachment and collets. New.
1—New No. 4 Stark Precision Bench Lathe, three-speed countershaft. New.
2—New 16-in. x 6-ft. Bradford Tool Room Lathes, with oil pan and taper attachment, Q.C., double back gear. New.
1—18-in. x 8-ft., Q.C. Bradford Lathe, friction double back gear. New.
1—Second-hand, 16-in.x 6-ft. Walcott, std. change Gear Lathe.
1—18-in. x 8-ft. South Bend Lathe.
1—21-in. x 10-ft. South Bend Lathe.
1—24-in. x 18-ft. Bradford Engine Lathe.
1—18-in. x 8-ft. Oliver Heavy Duty Engine Lathe.
1—16-in. x 8-ft. Cincinnati Engine Lathe.
1—18-in. x 8-ft. Cincinnati Engine Lathe.
1—18-in. x 10-ft. Cincinnati Engine Lathe.
1—15-in. x 6-ft. Crawford Tool Room Lathe.
1—4½ x 84-in. Lo-Swing Lathe with taper attachment.
2—15-in. power feed Carriage, 1 roller back rest and 6 tool holders, oil pump, piping and tool tray. New.

DRILL PRESSES
1—24-in. Aurora Sliding Head, back geared, power feed Drill Press, S.H.
4—20-in. Silver, power feed, back gear Drill Presses.
6—20-in. Silver, plain Drill Presses.
4—20-in. Plain Canedy-Otto Drill Presses, wheel and lever feed.
1—Used 3-ft. Prentis Plain Radial Drill.
1—2-spindle Demco High Speed, B.B., floor type Drill Press.
1—Single spindle, Demco, high-speed, B.B. bench type Drill Press.
1—Three-spindle Demco, high-speed, B.B., floor type Drill Press.
2—Lindgren 15-in. gear driven sensitive Drill Presses.
4—U. S. sensitive, sliding head, tilting table Drill Presses.
2—20-in. Excelsior plain wheel and lever feed Drills, with automatic stop.

SHAPERS
2—New 16-in. Queen City back gear Shapers.
2—20-in. Milwaukee back geared Crank Shapers.
1—No. 183 Rhodes Combination vertical and horizontal Crank Shaper, complete with swivel vise and countershaft.
2—20-in. Columbia back geared Crank Shapers, complete with vise and countershaft.
1—24-in. Hollingworth back geared Crank Shaper.

MILLING MACHINES
2—No. 1½ plain cone type Rockford Milling Machines. New.
2—No. 2-B Rockford Universal cone type Milling Machines, complete with dividing head, chuck, vise and regular equipment.
1—No. 2 plain, heavy duty, cone type Rockford Milling Machine.
1—No. 2 Universal high powered, all geared Rockford Universal Milling Machine.
1—No. 2½ Universal high powered, all geared, single pulley drive Rockford Miller.
1—No. 2 Universal, heavy duty, cone type Rockford Milling Machine.
1—Cleveland Horizontal Boring Mill, 2½-in. bar. New.
1—Lambert Horizontal Boring Mill, with 3-in. bar. New.
1—No. 2 Cincinnati Plain Milling Machine. New.
3—No. 6 Whitney Hand Millers. New.
3—U. S. Hand Millers. New.
1—No. 1-B LeBlond Plain Milling Machine. New.

PUNCH PRESSES
2—No. 1 V. K. & V. Inclinable Punch Presses.
1—No. 5 Niagara Open back Inclinable Punch Press.
2—No. 3 Loshbough-Jordan Openback Inclinable Power Punch Presses.
2—No. 4 Loshbough-Jordan Openback Inclinable Power Punch Presses.
1—No. 2 Moore Screw Press, width between uprights 16 in.
1—No. 3½ Greenerd Arbor Press, bench type.
2—No. 10 Royersford Foot Presses.
2—No. 3 Greenerd Arbor Presses, bench type.
2—No. 3 Atlas Arbor Presses, bench type.
1—No. 4 Atlas Arbor Press, on column.

SCREW MACHINES
1—1½-in. Cleveland five-hole turret automatic Screw Machine.
1—2½ National-Acme, four-spindle, automatic Screw Machine. New.
1—No. 5 Foster, geared head Screw Machine.
1—No. 4 Warner-Swasey Plain Head Screw Machine.
1—1½-in. Star Hand Screw Machine.
1—18-in. x 6-ft. Brass Turning Lathe.
2—No. 3 Stecher, 1 15/16-in. Hand Screw Machines.

HACK SAWS
3—Peerless, 6 x 6 high-speed Hack Saw Machines.
4—No. 1 Marvel 4 x 4 Hack Saw Machines.
4—No. 2 Marvel Draw-cut Hack Saw Machines.
1—Second-hand, Q.C., circular Metal Cutting Saw.

PLANERS
1—22 x 22-in. x 5-ft. Wheeler Planer, second hand, fine condition.
1—42 x 42-in. x 10-ft. table, Davis & Egan Planer.
1—Used, 26 x 26-in. x 12-ft. American spur-geared Planer.
1—30x30-in.x10-ft. Heavy Pattern Putnam Planer.
1—42 x 42-in. x 16-ft. Rockford, 2 heads on crossrail.
1—30 x 30-in. x 8-ft. Gray Planer. Used.
1—36 x 36-in. x 20-ft. Gray Planer. Used.
1—48 x 60-in. x 20-ft. Cleveland Openside Planer. Used.

PUNCHES, SHEARS AND ROLLS
2—New 30-in. Pettingell Rotary Shears.
1—Used No. 08 Niagara Circular Slitting Shear.
1—Set Used 10-ft. Hilles-Jones Bending Rolls.
1—Set Used 36-in. Pyramid Type Niagara Bending Rolls.
1—Set 10-ft. Bertsch Power Bending Rolls.
1—Set Used 20-in. Niles Plate Bending Rolls.

GRINDERS
1—Second-Hand Bath No. 2 Universal Grinder, complete with regular equipment.
4—No. 1 Wilmarth & Morman Universal Cutter and Reamer Grinders, power feed.
4—No. 1 Wilmarth & Morman Universal Cutter and Reamer Grinders, hand feed.
1—No. 3 Wilmarth & Morman Automatic Surface Grinder.
2—No. 2 Wilmarth & Morman Automatic Surface Grinders.
2—Wilmarth & Morman Yankee Drill Grinders.
2—No. 1 La Salle Surface Grinders.
3—No. 3 Western Emery Stands, with wheel and arbor covers.
1—No. 2 Fraser Universal Grinder, complete with internal grinding attachment.
1—No. 5 St. Louis Emery Stand on column with wheel and arbor cover guards.
2—No. 2 St. Louis Emery Stands, wheel and arbor guards.
3—No. 3 St. Louis Emery Stands on column, with wheel and arbor guards.
1—New Standard Electric Tool Co.'s Motor driven Bench Grinder.
1—New, No. 2, Noble and Westbrook Automatic Surface Grinder.
1—Second-hand No. 4 Gardner double end Disc Grinder, fine condition.
1—Used Warner-Swasey double head Internal Grinder.
1—Second-hand No. 3 Osterline universal Wet Tool Grinder.
1—New Globe bench type Lathe Tool Grinder.
1—New No. 7 18-in. Valley City Double End Disc Grinder.

YOUR INQUIRIES WILL BE APPRECIATED

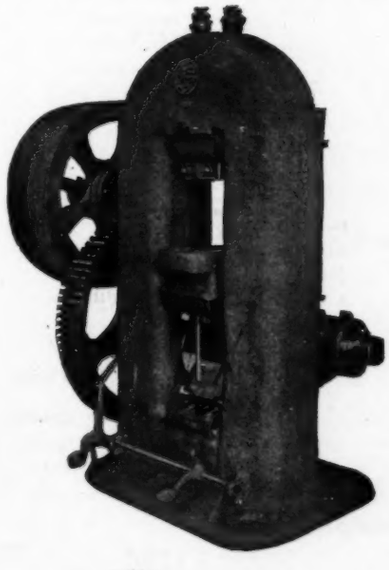
W. J. BAIRD MACHINERY CO., 265 Jefferson Avenue, Detroit, Mich.

Why wait months when these tools as good as new are available?

Potter & Johnston No. 6A automatic turret lathes.
Putnam 48-in. x 48-in. x 18-ft. planer with two heads on rail. As good as new.
Garvin No. 2½ turret screw machine.
Garvin No. ½ turret screw machine, capacity $1\frac{7}{16}$ inch.
Warner & Swasey No. 2A machine
Becker model AB vertical milling machine.
Bliss No. 20 inclinable press, safety clutch and finger attachment.
Consolidated No. 5 inclinable press, not geared.
Bliss No. 330 power gap shear.
Carlton 2½-ft. speedy belted sensitive radial drilling machine, with tapping attachment.
Diamond roll grinder, 7½-in. swing, 2½ between centers.

HILL, CLARKE & COMPANY, Inc.
The Machinery Merchants
156 Oliver Street, Boston, Mass. **136 Cedar Street, New York, N. Y.**

We have ten of these Ferracute E. G. No. 52 Coining Presses



suitable for coining and all metal novelty works. These presses are located near New York and are available for immediate delivery. Condition, guaranteed like new.

SPECIFICATIONS AS FOLLOWS:

Pressure exerted by bed at top of stroke	150	Tons
Weight complete	6200	Lb.
Diameter shaft at journals	$3\frac{1}{8}$	In.
Diameter shaft at crank	$4\frac{1}{16}$	In.
Distance between columns	10	In.
Stroke of moving bed	¾	In.
Adjustment of head downward	½	In.
Height, bed to head, when bed is down	12	In.
Diameter of fly-wheel	30	In.
Width of fly-wheel	5	In.
Weight of fly-wheel	475	Lb.
Speed of shaft per minute, about	50	Rev.
Speed of fly-wheel and loose pulley per minute, about	300	Rev.
Thickness of bolster	6	In.

Write, wire or telephone us for prices. Also ask for our new Stock List.

We have over 500 machine tools available from our New York stock and are equipped to satisfy your requirements.

MODERN MACHINERY EXCHANGE, 25 Church St., New York

Bargain Prices *Prompt Shipment*

WICKES QUALITY

Refitted Machinery

MONEY BACK GUARANTEE

BOILERS

1—400-hp. Wickes Water Tube, 150 lb.
2—300-hp. Wickes Water Tube, 150 lb.
2—72-in. x 18-ft. HRT, 150-hp., 125-lb.
2—66-in. x 16-ft. HRT, 100-hp., 125-lb.
1—74-in. x 25-ft. Manning Vert., 200-hp., 125-lb.
1—84-in. x 16-ft. Marine Portable, 100-hp.
1—15-hp. Ames, with engine on top.
100 other Boilers.

SMOKE STACKS

1—72-in. dia., 82-ft. high.
11—26-in. dia., 90-ft. high.

ENGINES

22 x 42 Allis-Chal. Corliss, 325-hp.
16 x 36 Murray Corliss, 150-hp.
14 x 30 Watts-Camp. Corliss, 100-hp.
12 x 30 Nagle Corliss, 80-hp.
10 x 24 Harris Corliss, 50-hp.
20 x 18 Watertown, 4-valve, 300-hp.
14 and 28 x 24 Buckeye Cross Compound, 300-hp.
16 x 14 Ames Automatic, 200-hp.
13 x 16 Chandler & Taylor Auto., 125-hp.
11 x 11 Ball & Wood Auto., 100-hp.
10 x 12 Erie Automatic, 70-hp.
16 x 16 Noye Throttling, 100-hp.
14 x 16 Nagle Throttling, 80-hp.
12 x 16 Erie Throttling, 60-hp.
10 x 12 Erie Throttling, 40-hp.
40-hp., 5-cylinder N. Y. Safety Gasoline Engine.
3—Dake No. 3½, 7-hp. Rotary Reversible Engines.
14 x 14 Nagle Vertical, 70-hp.
12 x 14 O & S Vertical, 60-hp.
9 x 9 Nagle Vertical, 30-hp.
75-hp. De Laval Steam Turbine, with reducing gears
200 other engines.

HOISTS

9½ x 12 Lambert, D.C., S.D., link reversing cableway engine, with friction spools and winch head.
7 x 10 Haiss D.C., D.D. Coal Hoist.
7 x 10 American, D.C., S.D.
6 x 12 Parker, D.C., D.D. with boiler.
6 x 12 Kendall, D.C., S.D., with boiler.
14 x 18 Lidgerwood, D.C., S.D., second motion reversing Mine Hoist.
60-hp., 220-volt, dir.cur., D.D. and swinger.
40-hp. Lambert, 220-volt, dir. cur., D.D.
35-hp. Kendall, 500-volt, dir. cur., D.D.
21-hp. Ladgerwood, 550-volt, dir. cur., D.D.

PUMPS

16 and 25 x 15 x 15 Worthington Comp. Duplex, 1800 g.p.m.
14 and 20 x 12 x 15 Worthington Comp. Duplex, 1150 g.p.m.
12 and 17 x 11 x 15 Worthington Comp. Duplex, 963 g.p.m.
10 and 16 x 10 x 10 Worthington Comp. Duplex, 753 g.p.m.
9 and 14 x 8½ x 15 Worthington Pot Valve, 565 g.p.m.
20 x 12 x 15 Worthington Pot Valve, Duplex 1170 g.p.m.
18 x 5½ x 18 Knowles Pot Valve Duplex, 366 g.p.m.
18 x 9½ x 12 Buffalo Duplex, 900 g.p.m.
17 x 12 x 15 Worthington Duplex, 1170 g.p.m.
16 x 10 x 10 Worthington Duplex, 750 g.p.m.
14 x 10 x 10 Worthington Duplex, 750 g.p.m.
16 x 10 x 16 American Single, 400 g.p.m.
14½ and 24 x 5½ x 18 Knowles Comp. Single, 100 g.p.m.
14 x 8 x 14 Epping-Carp. Pot Val. single, 260 g.p.m.
14 x 14 x 10 Blake Duplex, 1415 g.p.m.
12 x 14 x 12 Smith-Valle Duplex, 2000 g.p.m.
10 x 14 x 10 Worthington Duplex, 1660 g.p.m.
10 x 14 x 18 Warren Single, 800 g.p.m.
12-in. Worthington Centrifugal, 4000 g.p.m.
10-in. Morris Sand Pump, 3000 g.p.m.
4-in. Morris Centrifugal, with engine, 400 g.p.m
24 x 12 x 16 Cameron sinking, 587 g.p.m.
No. 6 Pulsometer sinking, 300 g.p.m.
12 x 14 Gould Triplex, 1530 g.p.m.
8 x 12 Deane Triplex, 700 g.p.m.
16 x 9 x 12 Knowles Underwriters, 750 g.p.m.
500 other Pumps.

ROTATIVE VACUUM PUMPS

8 x 18 x 12 Wheeler Wet.
8 x 18 x 18 x 14 Alberger, 2-stage Corliss, dry.

FEED WATER HEATERS

6000-hp. National.
4000-hp. Cochrane.
2500-hp. Goubert.
1200-hp. Berryman.
750-hp. National.
50 other Heaters.

MOTORS

200-hp. General Electric, 220/440-volt.
75 other A.C. Motors.
40-hp. C & C, 220-volt, D.C.
25-hp. Sprague, 220-volt, D.C.
15-hp. General Electric, 20-volt, D.C.,
10-hp. General Electric, 220-volt, D.C.
100-hp. General Electric, 110-volt, D.C.
80-hp. General Electric, 110-volt, D.C.
55-hp. General Electric, 110-volt, D.C.
30-hp. Rushmore, 110-volt, D.C.
20-hp. Westinghouse, 110-volt, D.C.
15-hp. C & C, 500-volt, D.C.
15-hp. General Electric, 500-volt, D.C.
85 other D.C. Motors.

GENERATORS

100-kw. General Electric, 125-volt Ames engine.
75-kw. General Electric, 125-volt, belted.
60-kw. Bullock, 125-volt Ames engine.
60-kw. Westinghouse, 125-volt, belted.
50-kw. Westinghouse, 125-volt Ideal engine.
50-kw. C & C, 250-volt Payne engine.
45 other Generators, all sizes.

COMPRESSORS

20 x 20 x 30 Rand Duplex Steam, 2000 ft.
12 x 19 x 14 x 18 Smith-Valle duplex compound, 750 ft.
12 x 18½ x 12½ x 12 Ingersoll, 2-stage, 526 ft.
14 x 12 x 12 Plant Straight Line, steam, 235 ft.
18 x 15 Ingersoll-Rand, duplex belted, 1600 ft.
40 other Compressors.

CRUSHERS

No. 5 Austin Gyratory.
No. 3 Gates Gyratory.
10½ x 22-in. Climax Jaw Crusher.

HEATERS AND BLOWERS

16—Pipe Coils, containing 23,400 ft. 1-in. pipe.
12-ft. Sturtevant Blower, with engine.
8-ft. Buffalo Blower, with engine.
78-in. Sturtevant Monogram Blower
55-in. Buffalo Cupola Blower.
1600 cu.ft. Sirocco Double Blower, with 75-hp. steam turbine.
84-in. Sturtevant Exhauster, with 3-hp., 220-volt, D.C. motor.
50 other Blowers and Fans.

MACHINE TOOLS

24-in. x 31-ft. Seliers Lathe.
18-in. x 15-ft. Blaisdell Lathe.
16-in. x 6-ft. Reed Lathe, taper attachment.
2 x 24-in. Jones & Lamson Turret Lathe.
24-in. Barnes Drill, sliding head, B.G.
28-in. Snyder, SH, B.G.
24-in. Foote-Burt Heavy Drill.
40-in. Bickford Radial, tapping attachment.
30-in. W. E. Gange Co. Plain Radial.
Newton 6-in. Cold Saw.
650-lb. Knoxville Steam Hammer.
600-lb. Lane Steam Drop Hammer.
30 x 30 x 8-ft. Whitcomb Planer.
26 x 26 x 6-ft. New Haven Planer.
21 x 96 Landis Universal Grinder.
4-in. Cox Pipe Machine.
6-in. Curtis Power Pipe Machine.
28-in. x 6½-ft. Newton Slab Miller.
No. 4 Brown & Sharpe Plain Miller.
No. 2 Brown & Sharpe Universal Miller.
Bement Horizontal Boring Mill, 2½-in. bar.
24-in. Hendey Shaper.
7-in. Alligator Shear.
10-ft. Hilles & Jones Plate Bending Rolls.
6-ft. Wickes Plate Bending Rolls.
Watson-Stillman Hydraulic Rail Bender.
3-ton geared Foundry Ladle.
No. 2 Brown & Sharpe Annealing Furnace.

TANKS

2—36-in. x 21-ft. pressure.
4—36-in. x 18-ft. pressure.
2—6 x 31-ft. new closed storage.
5 x 30-ft. closed storage.
5 x 16-ft. closed storage.
4—66-in. x 9-ft. enamel lined new.
42-in. x 26-ft. closed storage.
5—18 x 9-ft. 9-in. x 4-ft. open storage.
10 x 14-ft. 9-in. high open storage.

MISCELLANEOUS

26-in. Centrifugal Dryer.
6 x 6-ft. Steam Jacketed Kettle.
36 x 33-in. Jacketed Nitrating Kettle.
United States five-mould Brick Press.
New 21-ft. Exeter Concrete Mixer, steam power, on wheels.
No. 4 Ransome Batch Concrete Mixer.
6—2½-yd. Lockwood bottom dump Concrete Buckets.
3—1½-yd. side dump, 30-in. gage Cars.

We Buy and Sell Single Machines and Complete Plants

Send for Our Complete List

Wickes Machinery Co., Jersey City, N. J.

QUALITY AND PRICES ARE RIGHT

Powell 42-in. x 38-in. x 8-ft. Planer, all feeds.

Cincinnati 24-in. Back Geared Crank Shaper.

Prentice 36-in. Radial, Single Pulley, Right Angle Drive.

Cincinnati No. 1½ Plain Back Geared Miller.

Whiton No. 1 Automatic Gear Cutter, Spur and Bevel.

Southworth No. 2, 1-in. capacity, Hand Screw Machine.

LATHES

Flather, 20 in. x 10 ft., C.R.
Gisholt, 21 in. Turret.
LeBlond, 25 in. x 10 ft., Heavy Duty.
McCabe, 26 in., 46 in. x 20 ft. 6 in., Gap.

MILLING MACHINES

Garvin No. 14 Plain, B.G.
Hendey, Lincoln Type.
Brown & Sharpe No. 2, B.G.
Brown & Sharpe No. 00 Plain.
Garvin No. 11 Plain.

SCREW MACHINES

Brown & Sharpe No. O-G, Automatic.
Brown & Sharpe No. 4 Hand.
Hartford ½ in., 2-spindle.
National-Acme No. 54, Auto., ⅞ in. cap.

SHAPERS

Ohio, 20 in. Crank.
L-F, 26-in. Open Side.
Juengst, 15 in. Crank.
Fitchburg, 14 in. Traverse.
Boynton & Plummer, 9 in. stroke.

LYND-FARQUHAR COMPANY

MACHINE-TOOL VALUES

Boston, Mass.

RELIABUILT MACHINERY

SIMMONS MACHINE CO.

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We Have Hundreds of Other Tools and Supplies in Stock. Call or Write Us.

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New York

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PLANERS

38-in. x 38-in. x 12-ft. 6-in. Lincoln.
42-in. x 42-in. x 12-ft. Openside.
60-in. x 60-in. x 12-ft. Sellers.
73-in. x 48-in. x 13-ft. Lincoln.

GRINDERS

No. 23 B. & S. Internal.
No. 2 Norton Tool-Cutter.
New Dumore Electric.
Emery Stands, All Sizes.

DRILLS

Moline "Hole Hog."
3-ft. Dreses.
5-ft. Bickford.
7-ft. 3-in. Warren.

MILLERS

10-in. Simmons, Index Centers.
No. 2 Owen, Plain.
No. 3 Bowen, Plain.
New 3-H Leblond, Universal.
No. 6 Whitney, Hand.

LATHES

14-in. x 6-ft. Lodge & Shipley.
18-in. x 6-ft. American.
20-in. x 10-ft. Monarch (New).
28-in. x 12-ft. Boye-Emmes.
42-in. x 12-ft. Fifield.

BORING MILLS

No. 31 Lucas Horizontal.
34-in. King.

WOOD WORKING

24-in. Pony Planer.
36-in. Band Saw.
Vertical Sander.

Immediate Delivery of

USED MACHINERY

WOOD WORKING

American Woodwork Machy. Co. No. 401409, 34-in. band saw, rubber tired wheels, 32 x 32-in. cast iron adj. table, belt driven from motor.

American Woodwork Machy. Co. (Montgomery, Pa.) Levi Houston 8 in., 4 side outside molder, square heads, with attached countershaft, belt driven from motor, 700 knives for same.

Central Machine Works, double head shaper, double belted wood table, 41 x 48 in., with extension table 48 x 60 in., floor countershaft, belt driven from motor.

16 in. x 10 ft. pattern makers lathe, 4 slip cone, wood bed T rest, tail stock and overhead countershaft.

16-in. jointer, C. O. & D. A. Porter (Grand Rapids, Mich.).

Rip saw, Sidney Tool Co. (Sidney, Ohio).

IRON WORKING

Old style, 24 x 24-in. x 7-ft., spur gear planer, single head on cross railhand elevating device and overhead countershaft.

S. C. Forsaith Mach. Co. (Manchester, N. H.), 18 in. x 6 ft. single back geared engine lathe, rod and rack feed, compound rest and special tool holder overhead countershaft.

Pratt & Whitney Co. (Hartford, Conn.), 16 in. x 8 ft., single back geared engine lathe, compound rest, rack and screw feed and double friction countershaft.

Planer, 37 in. x 14 ft. Herringbone gear drive, single head with cross and vertical feed, A. Insler (Newark, N. J.).

Horizontal slide valve steam engine, 8 x 9 in., developing about 25-hp.

Lathe, 14 in. x 6 ft., four step cone, screw cutting, chuck, face plate, etc.

Lathe, 16 in. x 6 ft., four step cone, screw cutting, chuck, face plate, etc.

J. G. Blaunt, emery stand, taking 18-in. wheel.

Emery stand, arranged for 16-in., straight wheels on one side, and 16-in. cylinder, other side.

Air compressor (Rand Drill Co.), Imperial type, 10 shop No. 13366 size 8 x 8 x 10 steam, size 12 x 7½ x 10 air.

Q & C, metal cutting saw, 24 in. diameter x ¼ in. thick blade, manufactured by Hanna Engineering Works.

All above machinery is in good condition and can be inspected at our plant.
Prices and terms on application.

The Flour City Ornamental Iron Company
MINNEAPOLIS, MINN.

Grand Rapids Specials

34 in. Vertical Boring Mills.
4½ x 5 Ingersoll-Rand Air Compressor (2).
26 in. Sibley Sliding Head Drill.
28 in. Hamilton Sliding Head Drill.
No. 51 Canedy-Otto Wall Radial.
No. 2 Quint 6-spindle Turret Drill.
No. 2 Willey Electric Tool Post Grinder—110 volt. 60 c., 3 p.
Roll Feed for D-3 Ferracute Press.
Port Huron Drawing and Forming Rolls.
36 in. Gould & Eberhardt Spur Gear Cutter.
Greenfield Cutter Grinder.
No. 1 Racine Hack Saw.
No. 5 Marvel Hack Saw.
50 lb. Little Giant Power Hammer.
Smith Automatic Power Hammer.
18 in. Prentice Geared Head Turret Lathe.
16 x 8 Bogart Standard Engine Lathe.
18 x 8 Greaves Klusmon Standard Engine Lathe.
18 x 10 Cincinnati Standard Engine Lathe.
No. 1½ Valley City Plain Miller.
No. 25 Bilton Plain Miller.
No. 1-C Fox Plain Miller (2).
No. 3 Heavy Plain Miller.
No. 38 Chicago Hand Miller.
Arcade Portable Molding Machine.
No. 3 Consolidated Incl. Press.
No. 2 Consolidated Incl. Press (2).
No. P-3 Ferracute Punch Press.
No. 10 Excelsior Foot Press.
No. 0 Eveland Electric Riveter.
No. 16-P Lennox Throatless Shear.
¾ in. American Hand Screw Machine.
No. 518 P. S. & W. Power Groover.
No. 278 P. S. & W. Waugh Circle Shear.
No. 564 P. S. & W. Power Setting Down Machine.
No. 400 P. S. & W. 31 in. Power Forming Rolls.
Acetylene Welding Outfit.
No. 140 Toledo Spot Welder.

Ask for Complete List.

McMULLEN MACHINERY COMPANY
Everything in Shop Equipment
Grand Rapids, Michigan

New MACHINE TOOLS *Used*
Ready to Ship

SHAPERS—New
1—24-in. Ohio (New)

AUTOMATICS AND TURRET LATHES—New
1—2-in. Cleveland Auto. Model B (Shaft Machine—no turret), Oil Feed. (New).
4—6-in. Cleveland Auto. Model A (Turret Machines), Oil Feed. (Used).

LATHES—New
1—13-in. x 6-ft. Worcester swings 14½ in. (New.)
1—11-in. x 5-ft. Worcester
1—18-in. x 8-ft. Fitchburg C.R. and taper attach. (Used.)
5—7 x 32-in. Potter Precision Bench Lathes, compound rest and grinding counter. (New.)
1—16-in. x 6-ft. Flather. (Used.)
1—18-in. x 8-ft. McCabe. (Used.)

GRINDERS—New
2—No. 60 Heald Internal Cylinder, latest type, long table, 10-in. extension arm, 20-in. cross slide. (Used.)
6—No. 3½ Van Norman Auto. Radial Race Way for grinding internal and end thrust grooves, work head swings 9 in. (New.)
3—No. 3½ Van Norman Auto. Radial Race Way, for grinding internal and end thrust grooves, work head swings 9 in. (Used.)
3—No. 3½ Van Norman Auto. Radial External Face. (Used).
1—No. 2 Reid Surface, grinds 18 in. long x 6 in. wide x 12 in. high. (New.)
1—No. 120 Gardner Disc, plain, 18 in. discs for grinding parallel surfaces, maximum 7 in. wide. (New.)
1—Greenfield Universal Tool and Cutter. (New.)
1—Norton Live Spindle for 6 x 32. (New.)

DRILLS—New
1—14-in. U. S. Sensitive, cap. ½-in. drill, No. 2 Morse spindle, square and round tables. (New.)
5—Demco Bench, high speed ball bearing, cap. ½-in. drill, spindle speed 12,000 r.p.m. (New.)
3—Demco Floor, high speed, ball bearing, cap. ½-in. drill, spindle speed 3500 r.p.m. (New.)
1—Demco Floor, high speed, ball bearing, capacity ½-in. drill, spindle speed 3500 r.p.m. (New.)
1—Demco Floor, 3-spindle, high speed, ball bearing capacity ½-in. drill, spindle speed 2500-r.p.m. (New.)

MISCELLANEOUS—New
1—No. 1 Farwell Gear Hobber, cuts spur gears, worm wheels, ratchets, spline shafts, etc., capacity 12-in. dia. x 6-in. face; swings 3½-in. dia. hobs. (New.)
3—No. 75 Bliss Flywheel, opening in bed 7 in., area top of bed 12 x 16½ in., adjustment of bed on table up or down 9 in., closest adjustment 4 in., longest 13 in. Distance back from center to slide 2 in. Wheels 54 x 5 in. Total weight 5600 lb. (Used.)
2—6 x 6-in. Peerless High Speed Hack Saws. (New.)
1—No. 1 Manville Thread Roller, cap. ⅜ x 1 in. (New.)
1—1½ in Ajax Header (Used)
1—No. 2 Greenard Arbor Press. (New.)
5—No. 14 Globe Tumbling Barrels, oblique type, size 20 in. diameter x 22-in. deep. (New.)
2—Rust proof Tanks, lead lined, size 26 x 26 in. x 8 ft. (New.)
1—Compound Circular Table, for use on No. 14 Cochran-Bly Universal Shaper. (New.)
1—Bellevue Cyanide or Lead Furnace Pot, 8-in. dia., 14 in. deep, gas or oil. (New.)
1—Stewart Case Hardening Furnace, 24 in. wide x36-in. deep, gas or oil. (New.)
4—Stewart Cyanide or Lead Furnace Pot, 10 n.i dia. x 10 in. deep, gas or oil. (New.)

Direct factory Representatives of Manufacturers of
MACHINE TOOLS AND HEAT TREATING EQUIPMENT

CARPENTER & WOODWARD, Inc.
2571 Woolworth Bldg., New York City

SERVICE ELIMINATES COMPETITION

BOLT CUTTERS (Used)

1½ in. Double Head Acme, belted.
¼ in. Double Head Acme, motor 3/60/220.
1½ in. Single Head, Acme, belted. (2)
1½ in. Double Spindle Nut Tapper.

DRILLS (New)

25 in. Weigel, sliding head
20 in. Silver, power or hand feed.
14 in. Excelsior Sensitive, cap. ½ in.
10 in. Burke Sensitive Bench, cap. 7/16 in.
9 in. Western Chief Bench, cap. ½ in.

(Used)

5 ft. Prentice Radial, gear box, TA.
3 ft. Bickford Radial, plain.
3 ft. Dreses & Mueller, plain.
24 in. Fosdick Radial, plain.
24 in. Colburn, heavy duty.
20 in. Baker, heavy duty.
28 in. Cincinnati, power feed.
24 in. Cincinnati, sliding head.
24 in. Barnes, sliding head.
12 in. P. & W. Sensitive, cap. ½ in.
8-spindle Foote-Burt, cap. 1⅜ in.
4-spindle Foote-Burt, cap. ½ in.

GRINDERS (New)

18 in. x 2 in. W. & P. Wet Tool.
14 in. x 4 in. W. & P. No. 1¼-T.
No. 4 W. & P. Polishing Lathe.
No. 0 W. & P. Polishing Lathe.
18, 12, 10 in. Patch, double end.

(Used)

126 in. Bridgeport Knife, cupwheel.
No. 13 B. & S. Univ. & Tool.
14 in. x 40 in. Bath Univ. Tool.
12 in. x 12 in. B. & S. plain.
No. 5 Diamond Wet Tool, 36 in. wheel.
Diamond Knife, with 21 in. wheel.
Yankee Drill, 12 in. wheels, double.
Grindstone, wheel 48 x 6 in., reservoir.

HAMMERS (New)

100 lb. and 50 lb. Little Giant.

LATHES (New)

19 in. x 14 ft. Sidney, quick change.
19 in. x 12 ft. Sidney, quick change.
19 in. x 10 ft. Sidney, quick change.
17 in. x 10 ft. Sidney, quick change.
15 in. x 10 ft. Sidney, quick change.
18 in. x 10 ft. South Bend.
24 in. x 12 ft. South Bend.
16 in. x 8 ft. South Bend.
13 in. x 6 ft. South Bend.
14 in. x 6 ft. Filsmith, quick change.
16 in. x 6 ft. Filsmith, quick change.

(Used)

28 in. x 14 ft. Rahn, Mayer & Co.
26 in. x 12 ft. American, quick change.
24 in. x 12 ft. S. B. & E., 5 in. rais. blocks.
24 in. x 15 ft. Fifield, solid spindle.
24 in. x 15 ft. New Haven.
16 in. x 8 ft. Prentice.
16 in. x 6 ft. Prentice.
16 in. x 6 ft. R. M. & C.
16 in. x 6 ft. LeBlond.
14 in. x 5 ft. L. & S., quick change.
11 in. x 4 ft. Sebastian.
18 in. x 16 ft. Davis.

MILLING MACHINES (New)

Cleveland, No. 2 Univ
American, No. 1½, plain.
U. S. No. 1, plain, hand.
Bristol, vertical, 10 x 28 in.
Bickett, No. 1 and No. 0, hand.

(Used)

Cincinnati, No. 3 Univ.
Cincinnati, No. 3 Plain.
B. & S., No. 3 Univ.
Garvin, No. 4, plain.

PLANERS (Used)

30 in. x 30 in. x 8 ft. Gray, 1 head.
30 in. x 30 in. x 10 ft. American, 1 head
36 in. x 36 in. x 12 ft. Bickett, 2 heads. (New)

POWER METAL SAWS (New)

13 in. x 16 in. Peerless, speed box.
9 in. x 9 in. Peerless, belted.
6 in. x 6 in. Peerless, belted.
8 in. x 8 in. Economy, belted.
6 in. x 6 in. Economy, belted.

Partial List—Stock Shipments

McCOY-BRANDT MACHINERY COMPANY

210-18 PENN AVE., PITTSBURGH, PA.

REBUILT AND GUARANTEED

Immediate Delivery

LATHES

2—31-in. x 14-ft. Niles.
21-in. x 8-ft. Putnam.
20-in. x 10-ft. Fitchburg.
19-in. x 10-ft. Draper Patent Head.
2—19-in. x 8-ft. LeBlond.
2—18-in. x 10-ft. Reed
18-in. x 8-ft. Blaisdell.
18-in. x 8-ft. Pond.
16-in. x 6-ft. Hamilton, Q.C.G.
16-in. x 6-ft. Lodge & Davis, taper attachment
16-in. x 6-ft. Prentice, Q.C.G.
14-in. x 6-ft. LeBlond.
And 30 others from 12 to 20-in. swing.

TURRET LATHES

22 in. Gisholt
2—3 x 36-in. Jones & Lamson.
2—2 x 24-in. Jones & Lamson.
2—7 x 14-in. Potter & Johnson Semi-Automatic.
No. 2 Brown & Sharpe Hand Turret.
37-in. Chucking Lathe.
16-in. Warner & Swasey Turret Lathe.
2—1-in. Hartford Screw Machines

MILLING MACHINES

No. 5 Becker Brainard
No. 2-A Kempsmith.
No. 15 Garvin.

MILLING MACHINE Cont.

No. 2 Brown & Sharpe Universal.
1—Bogart Lincoln Type.

DRILL PRESSES

48-in. Niles Radial.
48-in. American Radial.
2—40-in. Barnes Horisontal Radial.
2—36-in. Bickford, Circular Base Table, motor driven.
30-in. Hamilton Radial
2—28-in. Snyder Motor Driven.
28-in. Barnes Vertical.
26-in. Prentiss Vertical.
26-in. Hamilton Sliding Head.
3—24-in. Sliding Head.
2—20-in. Vertical.
2—20-in. Baker.
20-in. Barnes Double Spindle.
20-in. Barnes Camel Back.
1—Baker, Style F, motor driven.
6-spindle Hendey, adj. heads.

MISCELLANEOUS

1500-lb. Dudgeon Arch Frame Hammer.
24-in. Hans Kraut Beam and Channel Shear; will cut beams and channels any size up to 24 in.; practically new; weight 52,000 lb.
100-150-ton Hydraulic Flanging and Forming Press, platen 7 ft. long and 42 in. wide; has four 4½-in. round uprights; measuring center to center 6 ft. 6 in. x 3 ft. 3 in. 3 ft. 10 in. clearance between the plates; 12¼-in. ram, 2-ft. 6-in. elevation; same has additional plunger 6 in. diameter operating inside the main plunger, extending through platen for internal flanging; weight 36,000 lb.
Large lot of miscellaneous ironworkers' tools, Punches, Presses, etc.
2—6-ft. arm Universal Swinging Grinders, 1¼-in. spindles.
No. 17 Besly Grinder.
No. 14 Brown & Sharpe Plain Grinder.
Heald Universal Tool Room Grinder.
18-in. Baylon Disc Grinder.
4-in. Jarecki Bolt Cutter.
No. 3 LaPointe Broaching Machine.
Rockford Broaching Machine, 15-in. stroke.
30-in. Cincinnati Pulley Lathe.
60-in. Henley Pulley Lathe.
Schuchart & Schutte Tooth Rounding Machine.
2-spindle Beaman & Smith Horisontal Boring Mill.
16-in. Springfield Oil Separator.
6-in. Espen Lucas Cold Cutting-Off Saw.
4—Saw Sharpeners.
20-in. Steptoe Shaper.
16-in. Walcott Shaper.

Send for Complete Stock List Just Issued

In addition to the above I have a large assortment of Engines, Pumps, Compressors, Machine Tools and General Machinery. Let me have a list of your wants. Correspondence Solicited.

HERMAN L. WINTERER, 941-53 N. Front St., Philadelphia, Pa.

MACHINERY

Tool Room and Production Machinery is offered subject to prior sale for immediate delivery. Also quantity of Machinists' Tools and Supplies, High Speed Steel, Electrical Wires and Cables, Shop Fixtures, etc.

Lathes

5—"Norwood" Lathes, 24-in. x 10-ft.
4—"Norwood" Lathes, 22-in. x 8-ft.
8—Single Purpose, type 13-J, Amalgamated Machinery Co.'s Boring Lathes with countershaft
2—Huntington Machinery & Foundry Co Special Lathes, 27-in. x 12-ft., motor-driven.
1—Geo. W. Fifield Engine Lathe, 18-in. x 8-ft.

Drill Presses

2—Francis Reid 12-in. Single Spindle Drill Presses.
1—Oliver 10-in. Single Spindle Drill Press.

Automatic Chucking and Turning Machines

8—No. 6A "Potter & Johnston" Automatic Turning Machines.

Milling Machines

1—Kempsmith Plain Milling Machine, size No. 5.

Grinders

2—O. S. Walker Tool Grinders.
1—Diamond Machine Co.'s 12-in. Grinder.
2—Fellows Gear Shaper Cutter Grinders.

Screw Machines

1—Cleveland Automatic 2-in. Plain Screw Machine.
4—Foster Screw Machines, No. 4.
2—Gridley Automatic Screw Machines.

Miscellaneous Machinery

1—No. 5-A High-Speed Special Hammer.
1—Rogers & Hurlbut 3-in. Cutting-off Machine.
1—Car Tenoning Machine, J. A. Fay Co.
1—American Blower Co.'s 10-hp., 9 x 7 in. vertical Steam Engine, No. 2094.
1—Cross and Spiers Power Tapping Machine.
1—No. 9 Core Machine, Railway Speed Recorder Co.
1—12-in. Birdsboro Coil Wire Belt Lacer.
2—Greenard Arbor Presses.
1—Black Diamond Works No. 5 Combination Band and Circular Saw Filing and Setting Machine.

Electric Motors

1—1-hp. G. E. Type, RC4, Form A2, 230-volt, D. C. Motor.
5—5-hp. Allis-Chalmers, 230-volt, D. C. Motors.
1—7½-hp. C. & C. Electric Co.'s Type S, 220-volt, D. C. Motor.
3—7½-hp. Allis-Chalmers, 230-volt, D. C. Motors.
1—65-hp. G. E., 250-volt, D. C. Motor.

Power Station Equipment

Capacity 250-kva., 11000/230-volt, 3-phase, 25-cycle, consisting of Westinghouse Transformer, Switchboard Panels, Westinghouse Watthour Meter, etc.

Miscellaneous

48—Ford 500-lb. Chain Hoists, also ½-ton trolleys for 7-in. I-Beam.
1—500-lb. Sprague Electric Hoists, with trolley for 7-in. Beam.
1—Koons Oil Burning Brass Melting Furnace.
5—Bristol Recorder Thermometers, complete with flexible connections.
5—6 in. to 12 in. Micrometers.

All machines are belt-driven unless otherwise specified. Detailed list on application.

GENERAL RAILWAY SIGNAL CO.
Rochester, N. Y.

IN STOCK

1—Allen High-Speed Drill, new.
1—Chicago No. 1 Automatic, new.
1—Chicago No. 3 Automatic, new.
6—Cleveland 2-in. Model "A" Automatics, magazine attachments.
6—Chicago Semi-Automatic Threading Machines, new.
5—Hercules Hand Screw Machines.
15—Newark 1¼-in. Screw Machines.
2—Horner 36-in. Wet Tool Grinders.
1—Blaisdell, 12 x 15 Air Compressor.
1—National ¾-in. Nut Tapper, used.
1—Detroit Automatic Drilling Machine, used.

INDUSTRIAL MACHINERY CORPORATION
99 Hoboken Ave., Jersey City, N. J.

AUTOMATICS

1—1¼-in., 4-spindle Gridley Automatic.
1—⅝in., multiple spindle, motor driven Gridley Automatic.
2—No. 54 National-Acme Automatic Machines.
2—No. 75 National-Acme Automatic Machines.

BORING MILLS

1—34-in. Colburn Boring and Turning Mill.
1—62-in. Niles-Bement-Pond Vertical Boring Mill.
1—No. 2 Rochester Horizontal Boring, Drilling and Tapping Machine.

FORGING MACHINERY

1—No. 7 high-speed Stop Motion Ajax Bulldozer.
1—1½-in. continuous feed Ajax Upsetting Machine.
1—1½-in. Williams Bolt Cutter.
1—1-in. Burdick Bolt Header.

CUT-OFF MACHINES

1—3-in. Hurlbut-Rogers Metal Cut-Off Machine.
1—4-in. Pratt & Whitney Cut-Off Machine.
1—5-in. Star Cut-Off Machine.
1—6-in. Hurlbut & Rogers Double Cut-Off Machine.

DRILL PRESSES

1—42-in. Barnes Drill Press.
1—No. 2 Quint Drill.
1—No. 1 20-in. Blaisdell Drill Press.
1—Automatic Feed Rockford Drill.

GRINDERS

2—No. 6 Semi-automatic Bryant Grinders.
2—No. 20 Bryant Internal Cylinder Grinders.
1—No. 50 Gardner Disc Grinder.
1—New Ford-Smith Grinder.

PLANERS

1—33-ft. heavy duty frog and switch Planing Machine.
1—22 x 22 x 4-ft. 10-in. Powell Planer.
1—22 x 36-in. x 9-ft. New Haven Planer.

HAMMERS

2—100-lb. Bradley Heelve Hammers
1— 600-lb. Sellers Steam Hammer.
1— 800-lb. Billings & Spencer Board Drop Hammer.
1—1000-lb. Bliss Board Drop Forging Hammer.
1—1000-lb. Morgan Hammer.
2—1200-lb. Massillon All Steel Steam Drop Hammers.
2—800-lb. Massillon All-Steel Steam Drop Hammers.

LATHES

1—14-in. swing Turret Lathe.
1—16 x 6-ft. Bullard Engine Lathe.
1—16 x 8-in. Blaisdell Engine Lathe.
2—22 x 8-ft. Norwood Lathe
2—24-in. x 12-ft. Wickes High Duty Engine Lathes.
1—88-in. Bull Lathe.

PRESSES

1—No. 79 Bliss Press.
1—No. 0 Consolidated Press.
2—No. 24 Stoll Direct Acting Horn Presses.
1—No. 8 Bliss Double Crank Drawing Press.
1—No. 407 Double Crank Bliss Toggle Drawing Press.
1—No. 3-C Straight Side Double Crank Bliss Press.

PUNCHES AND SHEARS

1—No. 17 Williams-White Punch and Shear.
1—5-ft. blade Power Shear.
1—12-in. throat Long-Allstatter Punch.
1—36-in. throat Rock River Punch, single end.
1—42-in. throat Rock River Single End Punch.

SHAPERS

1—24-in. Back Geared Milwaukee Shaper.
1—24-in. Back Geared Putnam Shaper
1—16-in. Davis Shaper.

WELDERS

1—No. 110 Toledo Electric Welder.
1—Electric Butt Welding Machine.
1—15-kw. Toledo Spot Welder.
1—No. 253 Toledo Spot Welder.

NATIONAL PRODUCTS COMPANY

East Liverpool, Ohio

A FEW CHOICE OFFERINGS

FOR IMMEDIATE DELIVERY

LATHES

2—New Yoke Head 15 x 6 Lathes, with quick change gear, pan bed
20 Cataract and Waltham Bench Lathes with slide rests, collets, grinding and screw cutting attachments
2—Walcott Lathe 16 x 8, Q.C.G., D.B.G., NEW

GEAR CUTTERS

Newark Gear Cutter, No. 2A, 24 x 8
Standard 4-in. Automatic Gear Cutter
Brainard 24-in. Automatic, spur and bevel

PRESSES AND SHEARS

2—No. 1½ Bliss Toggle-drawing
1—No. 3½ Bliss Toggle-drawing
2—No. 0¼8 Bliss double action Presses
36—Excelsior Foot Presses, NEW
1—No. 3-W Bliss Wiring
24—Excelsior Foot Presses
1—Niagara 5-ft. Power Squaring Shears
No. 39½ Bliss Horning Press
1—Standard No. 9 Inclinable Press
6—No. 4 Loeffler Inclinable Presses
2—No. 5 Loeffler Inclinable Presses
2—No. 6 Loeffler Inclinable Presses
1—No. 4 Stiles back wheel press

MILLERS AND SHAPERS

Brown & Sharpe No. 2 Universal Miller with vertical attachment
Hendey No. 2 Universal Miller with vertical attachment
Oesterlein Universal Miller
Le Blond No. 1½ Plain Miller
20-in. Cincinnati back-geared Shaper
21-in. American back-geared Shaper
30-in. Cincinnati triple-geared Shaper
20-in. Gould & Eberhardt Shaper
24-in. Queen City back-geared Shaper

DRILLS AND GRINDERS

6—New Excelsior Drills, 14-in. Sensitive
6—New 20-in. Back Geared Drills
Morse Universal Grinder, table 10 x 48
Walker surface grinder with magnetic chuck

MISCELLANEOUS

1—New Haven Planer, 24 x 24 x 5 ft.
1—Wood Tilted Turret Lathe, with wire feed
6—1-in. Turret Lathes, with wire feed
500-lb. Drop Hammer, Automatic Lift
1—Morgan 1¼-in. Bolt Cutter
1—1-in. Cleveland Automatic, 4-hole turret
1—Fox Lathe, with lot hubs
1—Brown & Sharpe No. 2 semi-automatic screw machine, full set collets.
Toledo spot welder

We also buy single tools or entire plants. Write or wire.

J. GELB & COMPANY, 201 Centre Street, New York City

HARRIS BROTHERS CO.

OFFER FROM STOCK

BORING MILLS

1—8-ft. Michel Vertical, 2-Rockfo. 24x72-in. horizontal

BENDING ROLLS

1—12-ft. Niles heavy roll; drop end housings, cap. ½-in. plate
1—Heavy 4x4x½-in. Angle Iron Bending Machine
1—10-ft. Bending Roll, 3/16-Plate

DRILL PRESSES

4—Barnes 20-in. B.G.
1—Barnes 22-in. B.G.P.F.
1—Kern 24-in. B.G.P.F.
2—Vertical spindle drill presses
1—Moline 4-spindle adj., 23-in. swing
3—Foote-Burt 4-spindle
1—Woodward & Rogers, 6 spindle, ½-in. cap.
1—Hoefer 36-in., 2-spindle adj. hvy.

GRINDERS

1—No. 60 Heald cylinder grinder
1—Diamond No. 244 roll grinder
1—Greenfield Universal tool and reamer grinder
2—No. 4 Gardner dbl. end grinders
1—Yankee Twist grinder
1—Higley saw or tool grinder
1—No. 2 Cincinnati Universal Grinder
1—Cam grinding attachment for Norton grinder
1—Middleditch comb. drill and tool grinder

HYDRAULIC RIVETING OUTFIT

1—Chambersburg 150-ton vertical yoke riveter, 12-ft. 8-in. gap., with accumulator traveling crane with hydraulic hoist, pressure pump, etc.
1—Allen 72-in. portable hammer riveter; cap. 1-in. rivets

1—16-ft. Gap Riveter
1—12-ft. Gap Riveter
1—10-ft. Gap Riveter

LATHES

1—Springfield 14x6-ft.
1—Fay & Scott 16x6-ft.
1—Linderman dbl. spindle shell lathe 17x20-ft
1—New Haven 18x12-ft.
1—Pond 20-in. x 8-ft.
1—Fifield 48-in. x 24-ft.
1—Potter & Johnston 24-in.
1—Reed 20x10-ft-6
1—LeBlond 14x8-ft.
1—Lodge & Shipley 18x8-ft
1—Bradford 14x6
1—Prentiss 13x6-ft.
1—Robbins 20-in. x 12
1—Potter & Johnston 6A
2—Potter & Johnston 5A.

MILLING MACHINES

1—48x36x12 planer type Ingersoll slab
1—Brainard & Pratt & Whitney Lincoln miller
1—No. 3 Garvin hand miller

SHEARS

1—Lennox rotary bevel shear, ½-in.
1—Weiner & Peis steel plate angle and I beam shear
1—Bement-Miles double end punch and shear, 22-in. throat
1—Single end shear, 22-in. throat
1—Single end shear 12-in. throat
1—Single end punch 27-in. throat
1—12-in. plate splitting shear
1—40-in. Rock River stake horn riveter, ½-in.
1—60-in. Queen City gate shear and multiple punch

GUILLOTINE SHEAR

1—Brand new Covington heavy Guillotine vertical gate shear; cap. 36-in. between housings; stroke 1½-in.; shears 1½-in. plate; Clutch control.

SHAPERS

1—16-in. Smith & Mills
1—Pedrick & Ayer open side, traveling head, 20-in. stroke

SCREW MACHINES

1—Kempsmith turret head, hand machine
1—15-in. Dreis
1½, 2 and 2½-in. Cleveland automatic
1—1-in. Pratt & Whitney automatic, dbl. spindle
1—No. 3 Acme
1—No. 2 Acme
2—No. 1 Foster

PUNCH PRESSES

1—No. 5 R. & K. O. B. I.
1—No. 4 Bliss solid back
1—Queen City solid back 5½-in. throat
1—Queen City solid back 9½x9-in. horn

MISCELLANEOUS

Broaching Machine No. 3 horisontal LaPointe
Buffing Stands (20)
Centering Machine, 3-in. Whiton
Cold Saw No. 21 Higley
Cold Saw, Q. & C., for 8-in. rounds
Corrugating rolls, car end, 72-in. cap. 2-in. pitch
Gear Cutter, spur, 60-in. Niles
Gear hobber No. 5 Lees-Bradner
Hydraulic presses, 60 and 80-ton vert.
Keyseater, 1-in. Morton
Nut tapper No. 4 Rodd automatic
Steel brake 10-ft. Dreis & Krumpf, for 18 gauge
Testing Machine, 6000-lb. Tinnes-Olsen
1—Niles 46-ft. span Electric traveling crane 4-motor type, 220-D.C., 15-ton cap. auxiliary hoist, 5-ton capacity

Ask for our Machinery Bulletin AM-306.

HARRIS BROTHERS CO.
CHICAGO

USED AND NEW TOOLS

Immediate Shipment

DRILLS

2—New Champion 14 in. plain lever feed upright drills
6—New Silver 20 in. stationary head drills
1—New Hoefer 24 in. sliding head drill, b.g. p.f.
2—New Richards 24 in. sliding head drills, b.g.,p.f.
1—New Snyder 28 in. sliding head drill, b.g., p.f.
1—New Cleveland 36 in. sliding head drill, b.g., p.f.
1—Used 3-spindle Pratt & Whitney sensitive drill
20—New Henry & Wright, 1, 2, 3, 4 and 6-spindle ball bearing drills
1—Used 24 in. Dreses plain radial drill

GEAR CUTTERS

1—Used 24 in. Fellows gear shaper
1—Used 36 in. Fellows gear shaper

GRINDERS

1—New No. 2 Gardner Ball Bearing disc grinder
2—New Oakley No. 2 Universal cutter grinders, 1 with power feed
2—New Ohio No. 2 Universal cutter grinders
1—Used Saxon horizontal surface grinder, table 36 in. x 12 in.
1—Used Pratt & Whitney 6 in. x 48 in. plain grinder

LATHES

8—New Dalton type "B" 4, 6 in. x 36 in. bench lathes on legs
3—New Monarch 14 in. x 6 in. Standard engine lathes
3—New Monarch 16 in. x 6 in. Standard engine lathes
1—New Oliver 16 in. x 7 ft. q.c.g. engine lathe
1—Used Flather 17 in. x 6 ft. quick change gear engine lathe
1—New National 17 in. x 6 ft. semi-quick change gear engine lathe
1—New National 17 in. x 6 ft. quick change gear engine lathe
3—New National 17 in. x 8 ft. quick change gear engine lathes
1—Used 17 in. x 10 ft. Lodge & Davis standard engine lathe
1—New 18 in. x 6 ft. Hollingworth standard engine lathe
2—New 18 in. x 8 ft. Hollingworth standard engine lathe, one with taper
5—New National 18 in. x 8 ft. quick change gear engine lathes
1—Used Lodge & Davis 18 in. x 8 ft standard engine lathe
2—New Monarch 18 in. x 10 ft. standard engine lathes
1—Used 18 in. x 10 ft. Muller standard engine lathe
1—Used 19 in. x 10 ft. Lodge & Davis engine lathe
2—New Monarch 20 in. x 10 ft. q.c.g. engine lathe
2—New Monarch 20 in. x 10 ft. standard engine lathes
1—Used 36 in. pulley lathe
1—Used New Haven 60 in. x 20 ft. bed triple geared engine lathe, raising blocks to 78½ in.

MILLING MACHINES

1—New No. 0 Bristol hand milling machine
2—New No. 1 Bristol hand milling machines
1—Used No. 2 Cincinnati plain milling machine
1—New No. 2 Bristol hand miller, back geared

PLANERS

1—Used Gray 24 x 24 x 6 ft. planer, one head
1—Used New Haven 27 x 27 x 7 ft. planer, one head
2—Used Enterprise 30 x 30 x 6 in. planer, one head

PIPE MACHINE

1—Used Victor 4 in. pipe machine

PRESSES

4—No. 18 Bliss o.b.i. presses, new
6—No. 20 Bliss o.b.i. presses, new
2—New No. 21 Bliss o.b.i. presses
3—New Style C-3 Ferracute open back inclinable presses

SHEARS

1—New Peck, Stow & Wilcox No. 137-A foot power squaring shear
1—New Peck, Stow & Wilcox No. 223, 52 in. power squaring shear, for 14 in. gauge

SCREW MACHINES AND TURRET LATHES

3—Used 3 x 36 in. Jones & Lamson, arranged exclusively for chucking
1—Used Hartford ¾ in. automatic pin machine
1—New No. 4 Southworth plain head screw machine, 1½ in.

SHAPERS

1—New Barker 16 in. b.g. crank shaper
1—Used Juengst 24 in. crank shaper
1—New Ohio 24 in. b.g. crank shaper

MISCELLANEOUS

1—Used 40 in. King Vertical Boring Mill, two heads
1—New Handy die filer, motor driven, 110-volt, d.c.
1—Used Acme 1 in. heading upsetting and forging machine
1—Used Williams & White 35 lb. hammer
1—New No. 3-A high speed riveter, ¾ in. capacity
1—Used No. 3 Burr cold Saw
1—Used No. 1 Mitts & Merrill keyseater

The above list is incomplete. Write us giving specifications of anything required.

FEDERAL MACHINERY SALES CO.
16 N. Jefferson St., Chicago, Ill.
212 Sycamore St., Milwaukee, Wis.

USED MACHINERY

Immediate Delivery

48 x 6 Springfield planer type GRINDER.

18 x 12 Porter CR PCF LATHE, 16-in. chuck fitted.

No. 0—14 sp. Fox DRILL.

23-in. Rockford sliding head DRILL.

No. 3A Cinn. auto spur GEAR CUTTER.

No. 3 Fox plain MILLER.

24 x 24 x 6 Flather PLANER.

8-in. Miller & Barnes CUTTING OFF SAW.

20-in. Gould & Eberhardt SHAPER.

The above can be inspected at our warehouse.

HENRY PRENTISS & CO.
Inc.
Formerly Prentiss Tool & Supply Co.
149 Broadway, New York, N. Y.

GOOD USED TOOLS

1—18-ft. Niles Plate Planer for ¾-in. Plates.
1—22-in. American Drill, Back Gear, Power Feed.
1—21-in. Cincinnati Wheel and Lever Drill.
1—16-in. x 8-ft. Lodge & Shipley Quick Change Gear Lathe, Taper Attachment, Double Back Gear.
1—42-in. x 12-ft., with Raising Block.
1—24-in. Bullard Vertical Turret Lathe, 1 Head on Rail, 1 S. H.
10—Potter & Johnson No. 3 Manufacturer's Lathe, with Draw Chucks.
1—32 x 32-in. x 8-ft. New Haven Planer, 1 Head on Rail.
1—26 x 26-in. x 10-ft. Pratt & Whitney.
1—42 x 42-in. x 16-ft. Rockford, 2 Heads on Rail, 1 S. H.
1—No. 5 Brown & Sharpe Vertical Milling Machine.
1—No. 0 Brown & Sharpe Auto. Screw Machine and Attachments.
1—No. 3 Brown & Sharpe 3-26-in. Spur Gear Cutter.
1—No. 2 Le Blond Plain Milling Machine.

THE E. A. KINSEY CO.
Cincinnati Indianapolis

"STAR" Lathes

IMMEDIATE DELIVERY

9-in., with 4-ft. and 5-ft. beds.
11-in., with 5-ft. and 6-ft. beds.
13-in., with 6-ft. beds.

Quick Change Gear—12-in. x 6-ft.

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Albany	Buffalo	New Orleans	Scranton
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Morris Machinery Co.

93-115 Chestnut St., Newark, N. J.
Formerly
NEWARK SECOND-HAND MACHY. CO.

60-in. Niles Car Wheel Boring Mill.
6-in. Bement Slotter with Rotary Table.
2—No. 5 Langlier Swaging Machines.
2—No. 3½ Langlier Swaging Machines.
28-in. Barnes B. G. Drill.
24-in. Davis Chucking Lathe.

INTER-CONTINENTAL MACHINERY CORPORATION

165 BROADWAY, NEW YORK CITY

MACHINE TOOLS

USED MACHINE TOOLS

LATHES
1—16-in. x 4-ft. Old Pattern.
1—16-in. x 8-ft. Steptoe & McFarlan.
1—18-in. x 8-ft. Special Pattern.
2—20-in. x 7-ft. 6-in. Old Pattern.
1—26-in. x 7-ft. 6-in. Special Pattern, on raising blocks.

TURRET LATHES
1¼-in. Garvin Hand Screw Machine.
2—2 x 24 Jones & Lamson.

DRILLS
1—30-in. Putnam.
3—20-in. four-spindle Barnes.
1—20-in. 3-spindle Foote-Burt, Independent Feed.

GRINDERS
1—No. 23 Brown & Sharpe Cylinder.
1—No. 6-18-in. Besly, double spindle, ring wheel.
2—No. 12 Gardner, double disc, with foot treadle.
2—No. 120 Gardner, double disc, with foot treadle.
1—Bath Universal.
1—Diamond Automatic Surface.
1—No. 2 Diamond Wet Tool.

MILLING MACHINES
1—No. 2-A Becker, vertical.
1—No. 2 Plain, old style.
1—Eynon & Ingersoll, old style.
2—No. 7 Brainard, Lincoln type, old style.

MISCELLANEOUS
1—No. 2 Bilton Automatic Gear Cutter.
1—No. 3 Canton Portable Crane and Hoist.
1—No. 7 Bellevue Industrial Furnace for gas.
1—Pratt & Whitney single head roll Corrugating Machine.
1—20-in. Pulley Lathe. 1—30-in. Pulley Lathe.
1—10-hp. Vertical Steam Engine.
1—250-hp. Buckeye Steam Engine.
1—7 x 9 Ingersoll Steam Driven Compressor.
1—Crank Planing Machine.
1—No. 4 Whitcomb Power Punch.
1—20-in. x 10-ft. Whiton Centering Machine.
1—4-spindle Acme Nut Tapper.
1—Belt Driven Power Hammer.
1—Borden Bolt Cutter.
1—No. 2 Garvin Automatic Tapper.
1—Beaumont & Son Drilling and Tapping Machine
1—20-hp. Jenney Motor, 220-volt, direct current 675-r.p.m.
1—1-spindle Garvin Profiler.
1—Style "D" Matson Cutting-off Machine.
1—Greiner Riveter.
1—No. 2 Townsend Riveter.
1—No. 1 Burr Cold Saw.

Vonnegut Machinery Co., Indianapolis, Indiana

M. J. WALSH MACHINERY CO.

141 Sycamore St., Milwaukee, Wisconsin

USED MACHINE TOOLS FOR IMMEDIATE DELIVERY

1—30 in. Bullard Vertical Boring Mill. Equipped with 1—5 hole turret; on rail. 80% new.
1—20 in. Foote-Burt Heavy Duty Drill, single pulley drive. 90% new.
2—24 in. Barnes all geared Drills. 95% new.
3—Spindle Henry & Wright High Speed Ball Bearing Drills. 70% new.
1—5 ft. Bickford Radial Drill, arranged for variable speed motor drive. 60% new
1—No. 1 Adams Automatic Gear Hobber. 65% new.
1—No. 3—26 in. Brown & Sharpe Automatic Gear Cutter. 90% new.
1—24 in. Fellows Automatic Gear Shaper 65% new.
2—36 in. Fellows Automatic Gear Shapers. 65% new.
1—12 x 36 Landis Universal Grinder, 70% new.
1—No. 12 Modern Plain Grinder, complete, with special attachments for internal and external grinding. 80% new.
1—No. 2 Mitts & Merrill Keyseater with special equipment. 90% new.
2—16 in. Warner & Swasey Universal Fox Turret Lathes with set over tail stock. Chasing Bar. With hobs and chasers. 90% new.
1—50 x 22 Pittsburgh Lathe, with tripled geared. Swings 51½ in. Taper Attachment. 70% new.
1—26 x 26 x 6 ft. Gray Planer with 1—head on the cross rail 90% new.
1—No. 17 Williams & White double end compound Punch and Shear with a number of attachments. 95% new.
1—6 in. Nicholson-Waterman Horizontal Cylinder Boring and Facing Machine, Motor driven.

1—12 X 96 IN. LANDIS PLAIN GRINDER.
1—6 X 18 LANDIS PLAIN SELF-CONTAINED GRINDER.
1—NO. 4 BROWN & SHARPE HORIZONTAL MILLING MACHINE.
1—NO. 6—62 IN. BECKER VERTICAL MILLING MACHINE.
1—22 X 10 HAMILTON STANDARD TYPE LATHE.
1—24 IN. KELLY SHAPER WITH VISE AND COUNTERSHAFT.
1—GREENFIELD CUTTER GRINDER WITH REGULAR EQUIPMENT.
5—12 IN. LELAND & GIFFORD DRILLS. 10,000 R.P.M. BENCH TYPE.
2—12 IN. LELAND & GIFFORD DRILLS. 10,000 R.P.M., WITH TAPPING ATTACHMENTS.
1—NO. 12 WATERBURY FARREL. GEARED, PILLAR TYPE, FORGING OR TRIMMING PRESS WITH SIDE SHEAR.
1—NO. 95 STILES & PARKER DOUBLE CRANK PRESS.

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E. B. STICKLEY MACHINERY CO.
GOEBEL BLDG., DETROIT, MICH.

NEW MACHINE TOOLS

FOR IMMEDIATE SHIPMENT

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Nos. 1, 3 and 5 Blount Dry Grinders, with Wheel Guards.
20-in. Blount Wet Tool Grinders, with Truing Device.
18 x 50 and 18 x 72 Sterling Plain cylindrical Grinders P. F.
Sterling Cutter and Reamer Grinders.
No. 3 Modern Universal Grinders.
Rivett Automatic Internal and Radial Grinders.
Rivett Hand Operated Radial Grinders

POLISHING MACHINES

Types A-B and F, Blevney Polishing and Finishing Machines.

SHAPERS

20-in. Cincinnati Shapers B. G.
24 in. Hollingsworth Shapers B. G.

LATHES

11 x 5 and 13 x 6 Blount Speed Lathes on Floor Legs.
Rivett Precision Bench Lathes.
18 x 8 Superior Engine Lathes with 15-in. 3-jaw Combination Chuck.
Whitcomb-Blaisdell 16 x 8 and 18 x 8 and 18 x 10 Standard Double Back Geared Engine Lathes.
11 x 6 Worcester Engine Lathes.

DRILLS

Demco Bench and Floor Drills.
20, 21 and 25 Weigel Drills.
3-ft. Hilbert Plain Radial Drills.
3-ft., 4-ft. Fosdick Plain Radial Drills.

SCREW MACHINES

1¼ x 10 Millholland Screw Machines.
2¼ in. x 10 in. Millholland Screw Machines.

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1—No. 1½ Valley City **Plain Milling Machine**, with countershaft and all standard equipment; U. S. standard dial, new machine, boxed for immediate delivery.

1—No. 4 Brown & Sharpe **Plain Milling Machine**, used, A-1 condition.

3—3 in. x 36 in. Jones & Lamson Hartness type Flat **Turret Lathes**—double spindle, geared head, belt feed, sliding head type for chuck or bar work, used, A-1 condition.

1—24 in. Gisholt **Turret Lathe**, 6 in. hollow spindle, slightly used, fine condition.

1—14 in. x 6 ft. Flather Standard **Engine Lathe**, Metric lead screw, used, good condition.

1—800 lb. Ferris & Miles single-leg **Steam Hammer**, slightly used.

1—32 in. x 32 in. x 8 ft. **New Haven Planer**, one head on cross rail, used, like new.

1—36 in. x 36 in. x 10 ft. Niles Heavy Duty **Planer**, two heads on cross rail, used, good condition.

Have you tried our "Tungsten" Hack Saw Blades? They never fall down. Delivered free.

The Geo. F. Foss Machinery & Supply Co.
30 Church St., New York City
Tel. Cortlandt 6500

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1 No. 6 Becker vertical spindle
MILLING MACHINE
with rotary table

1 No. 5 Brown & Sharpe vertical spindle
MILLING MACHINE

1 12 x 48 self-contained modern
CYLINDRICAL GRINDER

2 No. 6A model Potter & Johnston
CHUCKING MACHINES
equipped with motors, in excellent condition

All in excellent condition

AMERICAN MACHINERY EXCHANGE, INC.

217 Centre Street, New York

WEEKS OFFERS

FROM STOCK

1—28-in. Used Cincinnati Drill.
1—No. 2 New Wilmarth & Marmon Surface Grinder.
1—13-in. x 6-ft. New Worcester Engine Lathe.
2—No. 2 Used Brown & Sharpe Plain Millers.
1—24-in. New Osborne & Sexton back geared Shaper.

D. WEEKS MACHINE TOOL COMPANY
1270 Broadway, New York, N. Y.
Phone: Mad. Sq. 4906-2804

IMMEDIATE DELIVERY

Eynon-Ingersoll Slab Miller.

No. 5C Becker Vertical Milling Machine (new).

No. 205H Toledo Double Crank Geared Press (new), gap pattern, 96 in. between housings.

60-in. Bullard Vertical Boring Mill, 2 swivel heads.

No. 10—6-in. x 20-in. Brown & Sharpe Plain Grinder.

12-in. x 48-in. Modern Grinder.

Newton Gear Cutter for spur and bevel gears.

21-in. Gisholt Turret Lathe, taper attachment.

No. 3 Ryerson Geared Punch, capacity ¾ in. x ¾ in.

No. 4 Long & Allstatter Single End Punch and Shear, 24-in. throat, capacity ¾ in. x ¾ in.

Massillon Class 7 Single End Punch and Shear, 36-in. throat, arch jaws, capacity 1¼ in. x 1 in. (new).

32-in. x 18-ft. Bradford Lathe.

Stocker-Rumely-Wachs Company
117-121 N. Jefferson St., Chicago, Ill.

BORING AND DRILLING MACHINE

Beaman & Smith Floor Type Horizontal Boring and Drilling Machine, 3 in. bar. (Used)

GEAR CUTTER

No. 4 Brown & Sharpe Automatic Gear Cutter. Cap. 36 in. x 10 in., with large number cutters, arbors, etc. (Used)

GRINDER

No. 2 Brown & Sharpe Universal Grinder. Cap. 12 in. x 30 in. (Used)

LATHES

Pit Lathe, 10 ft. swing, 72 in. face plate. Triple geared. (Used)
50 in. Niles Pulley Lathe. (Used)
50 in. x 20 ft. Fifield Triple Geared Lathe. (Used)
48 in. x 24 ft. Putnam Triple Geared Lathe, with raising blocks to swing 60 in. (Used)

BOLT CUTTER

3½ in. Acme Bolt Cutter. (Used)

HAMMERS

7-ton Morgan Double Frame Steam Forging Hammer. (Used)
600 lb. Merrill Board Drop Hammer. (Used)

PLANERS

60 in. x 60 in. x 28 ft. Betts Planer, two heads. (Used)
70 in. x 54 in. x 11 ft. 6 in. New Haven Planer, two heads. (Used)

SHAPER

30 in. Morton Draw Cut Shaper. (Used)

Also complete line of Machine Shop Equipment

What have you for sale?

DAY MACHINERY COMPANY
651 Ellicott Sq., Buffalo, N. Y.

SECOND-HAND MACHINERY

DRILLS

2—No. 117 Moline heavy single spindle
Allen four spindle high speed ball bearing NEW

GEAR-CUTTERS

48 in. Gould & Eberhardt, spur, heavy type

ENGINE LATHES

15 in. x 6 ft. Johnson, compound rest, taper
16 in. x 6 ft. Fifield, raise and fall rest
2—21 in. x 10 ft. LeBlond crankshaft lathes
24 in. x 7 ft., with turret on shears
32 in. x 16 ft. Fay & Scott, compound rest, turret on shears, turret tool post
60 in. x 26 ft. Thayer-Houghton, compound rest, triple geared faceplate

PLANERS

24 in. x 24 in. x 6 ft. Rockford. NEW

TURRET LATHES AND SCREW MACHINES

2½ in. x 26 in. Acme flat turret, with bar and chuck equipment
3 in. x 36 in. Jones & Lamson flat turret, with bar equipment
⅛ in. Cleveland automatic
¼ in. and 1 ¼ in. Hartford automatics

MISCELLANEOUS

2 in. Jarecki Pipe Machine
3 in. Stoever Pipe Machine
12 in. Burke Cold Saw
12 in. Springfield Plain Crank Shaper
No. 1-A New Duty Punch and Shear

MARSHALL & HUSCHART MACHINERY CO.
915 Chemical Bldg., St. Louis, Mo.
17 So. Jefferson St., Chicago, Ill.

1—32 x 32 in. x 8 ft. New Haven Spur Geared **Planer**, with one head on cross rail, power elevating.
1—No. 14 Gardner Double Disc **Grinder.**
1—No. 3, 26 in. Brown & Sharpe Automatic Gear **Cutter**, used three months.
2—5-A Potter & Johnston Chucking **Machines.**
1—No. 1 Landis Universal **Grinder.**
1—3 in. Hurlbut Rodgers Cutting-off **Machine.**
2—New No. 666 Toledo **Presses.**
1—New No. 856 Toledo **Press.**
2—New No. 873 Toledo **Presses.**
7—New Bullard Special Cartridge Case Finishing **Lathes.**
1—4 ft. Prentiss 2nd **Radial Drill**, cone drive.
1—New 24 x 12 Springfield Quick Change Gear, 3 Step Cone, Double Back Gear **Lathe.**
1—New 18 in. x 10 Cincinnati Quick Change Gear, 3 Step Cone, Double Back Gear **Lathe.**

THE SEIFREAT-WOODRUFF CO.
802 Conover Bldg., Dayton, Ohio
610 Baymiller St., Cincinnati, Ohio

Machine Tools

Immediately Available

MILLING MACHINES

One Cincinnati No. 3 double back geared Universal Milling Machine with pump, spiral universal centers, and vertical spiral cutting attachment; excellent condition.

One Oesterline No. 20 plain back geared Milling Machine with universal centers; excellent condition.

One Milwaukee No. 1 back geared Universal Milling Machine, all feeds, cone drive; excellent condition.

One Garvin No. 11 Plain Milling Machine, practically new.

One Fox Plain Milling Machine.

One Pratt & Whitney No. 6 Heavy Planer Type Slab Miller.

TURRET LATHES

Two Gisholt Turret Lathes, 21-in. swing, taper attachment; excellent condition.

ENGINE LATHE

One Fifield 30-in. x 10-ft. triple geared Engine Lathe; excellent condition.

PLANERS

One Pratt & Whitney 24 in. x 6 ft. Planer, excellent condition.

One Whitcomb-Blaisdell 26 in. x 8 ft. second belt drive planer, two heads on the rail, new.

One Chandler Planer 36 in. x 12 ft., with two heads, excellent condition, arranged for motor drive.

FACTORY & MILL SUPPLY CO.
137 Oliver Street, Boston, Mass.

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23-25 Purchase Street, Boston, Mass.

MACHINERY SPECIALS

1—Binsee Horizontal Knee Type **Boring Mill**, 2½-in. bar, fine condition.
1—Prentice 6-ft. **Radial Drill**
1—Bickford 5-ft. Universal **Radial Drill**
1—American 3-ft. Sensitive **Radial Drill**
1—Putnam 48-in. x 24-ft. B.G. **Screw Cutting Engine Lathe**, compound rest. Large chuck face plate, raising blocks for 60-in. swing
1—Becker Model AB Vertical **Milling Machine**
1—Gould & Eberhardt 24 x 7-in. **Gear Cutter** for spur gears only
1—New Haven 40 x 40-in. x 12-ft. Single Head **Planer**
1—Pratt & Whitney 40 x 40-in. x 14-ft. Single **Head Planer**
1—Sellers 36 x 36-in. x 20-ft. Single Head **Planer**
1—New Haven 34 x 34-in. x 8-ft. Single Head **Planer**
1—David W. Pond 26 x 26-in. x 6-ft. Heavy Duty **Planer**
1—Chandler 24 x 24-in. x 8-ft. Single Head **Planer**, extra heavy box bed type
2—Stockbridge 16-in. Heavy Duty B.G. **Shapers**, like new
1—Pratt & Whitney 10 x 48-in. Cylindrical **Grinder**, complete
2—Jones & Lamson 3 x 36-in. **Turrets**, sgl.pul.drive
1—Jones & Lamson 2 x 24-in. **Turret**, sgl.pul.drive
1—**Combination Punch and Shear**, capacity 5 x 1-in. flat and 2-in. round bar
1—Waterbury-Farrel Foundry Rack and Pinion **Drawing Press**, 42-in. stroke, 16 x 19½-in. bed, 50 ton capacity
3—Wheeler Heavy B.G. **Power Punches**, capacity ¾ x ¾-in., weight each, 4000 lb.
1—Northern Electric **Traveling Crane**, 5 ton capacity, A.C. motors, 30 ft. span. Good as new

IMMEDIATE DELIVERY

Greenlee 3½x40 Turret Lathe, bar equipment, new
Wilbraham-Greene High Pressure Blower, 25 H.P. motor, new
Heald, 13-in. Magnetic Chucks, 110 volt, new
Garvin No. 1 Screw Machine, new, ¼-in. capacity
Ott No. 2 Universal Grinder, new
General Electric 15 H.P., 220 V. D.C. Motor, new
Two (2) Cleveland 3½in. Model "A" Automatics, new
Charles L. Parmele, 50 Church St., New York

FOR SALE

1—1000-lb. E. W. Bliss Board Drop

FORGING HAMMER

good condition.

RICHMOND FORGINGS CORPORATION
(Acca) Richmond, Va.

FOR SALE

COMPRESSORS—STEAM PUMPS—ENGINE—BLOWERS

2—Hall Steam Driven Air Compressors, 10 x 13¼ x 10.
2—Hall Steam Driven Air Compressors, 14 x 20¼ x 14.
1—Knowles Duplex Steam Pump, 6 x 8½ x 6.
1—Knowles Duplex Steam Pump, 10 x 8½ x 10.
1—Armington & Sims Engine, 8½ x 10.
2—Garden City No. 8 Double Belted Blowers, 16 in. outlet.

BROWNELL MACHINERY CO.
Providence, R. I.

PUNCH AND SHEARS

1—50-in. Throat, Single End, 1 in. x 1 in. cap.
1—42-in. Throat, Single End, 1 in. x 1 in. cap.
1—36-in. Throat, Single End, 1 in. x 1 in. cap.
1—34-in. Throat, Single End, 1 in. x 1 in. cap.
1—12-in. Throat, Double End, 1 in. x 1 in. cap.
1—7½-in. Throat, Double End, ⅞ in. x ¾ in. cap.
1—6-in. Throat, Double End, ¾ in. x ¾ in. cap.

We carry in stock full line of Machine Tools. Send us your inquiries.

WAYNE MACHINERY COMPANY
Fort Wayne, Indiana

Tools for Immediate Shipment

14 in. x 6 ft. Hamilton Lathe, h.s., comp. rest.
18 in. x 8 ft. Hamilton Lathe, dbl. bk.gr. New.
1½ in. S. & K. Hand Screw Machine.
1½ in. Wood Hand Screw Machine.
1½ in. S. & K. Hand Screw Machines (2).
16, 18 and 24 Barker Shaper, crank. New.
24, 24 in. x 6 ft. Sellers Shaper.
3½ in. Canedy-Otto Radial, plain. New.
4½ ft. Plain Radial. Baush.
Grand Rapids Grinder, Cutter and Reamer.
Miller No. 2 B & S., heavy, plain.
16 in. x 6 ft. Springfield Lathe, h.s., C.P.R. taper
25 in. x 24 ft. Fifield Lathe.
20 in. x 16 ft. Le Blond Lathe h.s., C.P.R.
2 x 24 and 3 x 36 J. & L., double equipment.
22 x 22 in. x 6 ft. Gray Planer.
24 x 24 in. x 8 ft. American Planer.
26 x 26 in. x 8 ft. Niles Planer.
32 x 32 in. x 10 ft. Niles Planer.
Boring Mill, 10 ft., 2 swivel heads.
Boring Mill, 34 in. Colburn, 4 hole Turret Head.

THE OSBORNE & SEXTON MCHY. CO.
Columbus, Ohio.

FOR SALE

1—¾-in. Multiple Spindle Gridley Automatic

SCREW MACHINE

In first-class condition. Only been running a short time. Equipped for motor drive. Motor is a Westinghouse Motor, constant speed, Type C.S., 3-hp., 60-cycle, 550-volt, 3-phase, 1130-r.p.m.

THE HEALD MACHINE CO., Worcester, Mass.

FOR SALE

1—200-lb. capacity Duplex type Oxweld Acetylene Co.'s low pressure

GENERATOR

complete with 20 No. 2 burner tips.

Equipment now in operation, subject to inspection and test Prices on application.

STEWART MFG. CORP.
4535 W. Fullerton Ave., Chicago, Ill.
Purchasing Dept.

FOR SALE

About 2,000 ft. No. 102

WHITNEY ROLLER CHAIN

made by Whitney Mfg. Co. Brand new. Never used.

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THE DUFF MFG. CO.
ittsburgh, Pa.

BOOM UNCLE SAM

Better business than ever

Do you want an

ELECTRIC MOTOR

Largest Stock in America?

Get our prices first

NATHAN KLEIN & CO.
Baxter and Centre Sts., New York City

Just Released from Service

Hundreds of

MODERN MACHINES

Offered for Sale at

VERY LOW PRICES

Many of which we have only used from 12 to 15 months

All Machines Ready for Inspection

ENGINE LATHES

16-in. x 8-ft. Q.C.G.
18-in. x 8-ft. and 10-ft., Q.C.G.
20-in. x 8-ft. and 10-ft., Q.C.G.
25-in. x 10-ft. and 12-ft., Q.C.G
(The above are Standard Engine Lathes)
26-in. Bridgeford Heavy Duty Engine Lathes. Ideal Lathes for Forging Plants and Heavy Machine Work.

TURRET LATHES

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1—No. 4 **Diamond Surface Grinder,** with countershaft and two magnetic chucks, each 6 in. x 26 in.

KELLER PNEUMATIC TOOL CO.
Grand Haven, Mich.

WANTED

WHEEL PRESSES

Three 150 to 300-ton horizontal hydraulic Wheel Presses. Give full details and price.

Address W557—American Machinist
1570 Old Colony Bldg., Chicago, Ill.

WANTED

The following used machine tools:

LATHES
42-in. swing
SHAPER or SMALL PLANER
J. & L.
TURRET LATHE
3 x 36 in.
Warner & Swasey
TURRET 5-IN.

Name lowest cash price

THE NIEBLING-MARKSTEIN CO.
Cincinnati, Ohio

LOCKERS

Will buy 100 to 150 metal lockers in good condition. Delivery at New York. Give specifications and prices

McGRAW-HILL CO., Inc.
10th Ave. at 36th St., New York, N. Y.

FOR SALE BY
Eagle Iron Works Box 237, Pine Bluff, Ark.

SHEET METAL TOOLS, ETC.

A complete set of Hand Power Tools for operating job-repair, boiler and sheet-iron shop, consisting of Punches, Rolls, Shears, Drill Press, Forges and Blacksmith Tools, Pipe and Bolt Stocks and Dies, Taps, etc.

WANTED

HYDRAULIC PRESS

for drawing lead pipe and wire.

CAMBRIDGE SMELTING CO.
100 Pacific St., Cambridge, Mass.

WANTED TO PURCHASE

ROLLING MILL

Second-hand. State capacity and price. Also state whether or not it will be necessary to purchase the land and buildings with the rolling mill proper.

W454—American Machinist
10th Ave. at 36th St., New York City

FIRST—Get Bulletin 250—88 pages Bargains.

ZELNICKER IN ST. LOUIS

Before buying or selling
BIG TOOLS
Rails, Locomotives, Cars, Tanks, Machinery, Power Plant Equipment, etc.
What have you for sale?

WANTED

An old established export house is in the market for a large quantity of screw machine products

as used on bicycles and motorcycles, i.e., hubs, axles, pedals, cones, cotter pins, etc., etc.

Reliable manufacturers with large capacity.

W508—American Machinist
10th Ave. at 36th St., New York City

NOTICE!

Owing to the holiday next week the forms for the

Searchlight Section

of the January 2nd issue of

AMERICAN MACHINIST

will close for press, Thursday, 10 A. M., December 26th.

MAIL YOUR COPY NOW!

FOR SALE
As good as new
Three No. 2 American Rotary
GAS FURNACES
in which carbonizing is done with gas, completely equipped with heat controllers.
KOEHLER MFG. COMPANY
Marlboro, Mass.

WANTED TO PURCHASE

BORING MACHINE

Modern horizontal, fitted with boring bar about 4 in. diameter; suitable for pump or engine manufacturing. Must be guaranteed in good repair. Mail description and price to

DARLING BROTHERS, Limited
120 Prince St., Montreal, P. Q., Canada

WANTED

STEAM LOCOMOTIVE

35 to 50-ton, 36-in. guage, Mill Type,

THE CANTON SHEET STEEL CO.
Canton, Ohio

WANTED

2—16-in. or 18-in.

ENGINE LATHES

8-ft. bed, complete—new or second hand. State price, delivery, terms, etc., with illustrations, if possible.

W559—American Machinist,
10th Ave. at 36th St., New York

WANTED

3 Brown & Sharpe No. 2

SCREW MACHINES

Must be machines not over one year old, and in good order. Name prices, stating delivery.

BUFFUM TOOL COMPANY
Louisiana, Mo.

Get Your Wants into the Searchlight

ADVERTISING RATES

Ads Set in Uniform Style

(Solid, in one paragraph, without display.)

THREE CENTS A WORD, minimum charge 50 cents an insertion, payable in advance, less 10 per cent. If one payment is made in advance for four continuous insertions—for advertisements under:

Positions Wanted	Vacation Work Wanted
Evening Work Wanted	Tutoring
	Salesman Wants Connections

FIVE CENTS A WORD, minimum charge $1.50 an insertion, for advertisement under:

Agencies Wanted	Positions Vacant
Agents Wanted	Partner Wanted
Business Opportunities	Representations Wanted
Desk Room for Rent	Salesmen Wanted
Educational	Patents for Sale
Employment Agencies	Plants for Sale
Desk Room Wanted	Sub-Contracts Wanted
Foreign Business	Work Wanted

Miscellaneous for Sale, for Rent or Want Ads.

THIRTY CENTS A LINE, minimum five lines, for all undisplayed advertisements set with a paragraph for each item or tabulated.

THREE DOLLARS AND SIXTY CENTS AN INCH for advertisements for bids (Official Proposals).

Ads Set in Display Type

(Individual space, within border rules.)

Space for these advertisements is sold by the inch. Each page contains 30 inches. The rate per inch is based on the *total* number of inches to be used—that is, the number of inches the advertisement is to occupy multiplied by the number of insertions it is to receive. For instance, a 2-inch advertisement in 2 issues earns the 4-inch rate of $2.90 an inch. A 1-inch space for 4 issues, or a 4-inch space in one issue, also earn the 4-inch rate.

SCHEDULE OF RATES

1 to 3 in., $3.00 an in.	15 to 26 in., $2.70 an in.
4 to 7 in., 2.90 an in.	27 to 49 in., 2.60 an in.
8 to 14 in., 2.80 an in.	50 to 99 in., 2.50 an in.

Rates for larger space furnished on request.

For quick and satisfactory results tell the reader everything that he will want to know.

INFORMATION

ALLOW FIVE WORDS for the address, if replies are to a box number in care of any of our offices. There is no extra charge for forwarding replies.

IN REPLYING TO ADS, do not enclose original testimonials or anything that you may want returned. State your experience and qualifications in as concise and neat a manner as possible and enclose copies of your testimonials.

BE CAREFUL TO PUT ON ENVELOPE, when answering any "blind" ad, the box number in the ad, the name of the paper, and also the local address of office to which reply is sent:

36th St., at 10th Ave.,	New York
935 Real Estate Trust Bldg.,	Philadelphia
657 Leader-News Bldg.,	Cleveland
1570 Old Colony Bldg.,	Chicago
519 Newhouse Bldg.,	Salt Lake City
501 Rialto Bldg.,	San Francisco

WHEN ADVERTISING MACHINERY, use your own name and address—or a local address of some kind—so that the readers can wire direct and get quick replies. We advise also that you state in your advertisement the present location of plant that is offered for sale, or point of delivery provided you are in the market for equipment.

TO SIGN YOUR NAME and address to your advertisement begets the confidence of the reader and facilitates receiving replies. You can, however obviate delay in receiving answers by signing your ad. only with initials (your own or others), care of your home, your office or a post-office box number in your city.

POSITIONS VACANT

Canada

FOREMAN to take charge of manufacturing steel cut gears in large plant. Must be thoroughly familiar with spur, bevel and spiral gears, especially for automobile use. State age, experience, and salary expected. P-565, Am. Mach.

Illinois

DROP DIE SINKER for small toolwork. Applications with references and full particulars to M., K. & S., 3226 Belmont Ave., Chicago, Ill.

FACTORY superintendent wanted. A-1, high-class man to take complete charge of Chicago plant, employing about 200 hands, making varied small automobile parts and accessories. Must be a practical man with clear record, and a producer. Require experience with automatic and hand screw machines, punch presses, assembly departments, etc. Good salary and a percentage of the profits to the right man. Give full details and references. Confidential. P-581, Am. Mach., Ill.

Indiana

ALL-ROUND tool makers wanted. Small shop, light work. Top salary. Steady work. The George Stant Machine Works, Connersville, Ind.

GENERAL foreman wanted to take charge of tool and die room and punch press department in jobbing shop. Must also be able to design dies and estimate cost of dies, estimate cost finished product, especially on drawing and forming work. State number of years of experience and give in detail work you have been doing in past 3 years. P-513, Am. Mach., Chicago.

Massachusetts

DESIGNING and Detail Draftsmen—For permanent positions with large manufacturing concern in New England. Men with electrical, steam engine, turbine or special machine experience. Apply, giving age, experience, education and salary expected by addressing "Chief Draftsman," P-483, Am. Mach.

In Replying to "Blind" Ads

be careful to put on envelope the key number in the ad. and also local address of office to which reply is sent.

10th Ave. at 36th St., New York.
935 Real Estate Trust Bldg., Phila.
657 Leader-News Bldg., Cleveland.
1570 Old Colony Bldg., Chicago.
519 Newhouse Bldg., Salt Lake City.
501 Rialto Bldg., San Francisco.

Important

Original letters of recommendation or other papers of value should not be enclosed to unknown correspondents—send copies.

POSITIONS VACANT

Michigan

TOOL-ROOM foreman, experienced on jig fixture and die work and accustomed to handling men, in modern plant manufacturing automobile parts. P-575, Am. Mach., Chicago.

New Jersey

FOREMAN for tool department with a concern employing about 40 people in the tool department, and doing a variety of high interchangeable work. Modern plant in an excellent location, manufacturing an article with an international reputation. Applicants will please state age, qualifications, and salary desired. P-536, Am. Mach.

FOREMAN wanted for punch press department, having a complement of about 35 people, doing a variety of small work, using sub-press dies and other high-grade tools. This requires an executive and a mechanic for high quality work, rather than a quantity producer. State age, experience and furnish references. P-535, Am. Mach.

New York

DESIGNING engineer wanted. We manufacture a complete line of high quality machine tools and want a first-class designer, with executive ability, to take charge of and manage our Engineering Department. An unusual opportunity for the right man. P-555, Am. Mach.

MACHINISTS and toolmakers; must be first-class; give references. Write or apply to P-586, Am. Mach.

POSITIONS VACANT

FACTORY superintendent wanted, well up in instrument work. Must be thoroughly posted on automatic screw machine and punch press work, also assembling and related departments for plant near New York City. State education and training in detail and salary expected. P-566, Am. Mach.

MACHINIST instructor. American, intelligent, experienced machinist and toolmaker wanted as assistant teacher in machine shop of private trade school in New York City. No previous teaching experience required; salary beginning at about $140 a month. Apply by letter, stating age, married or unmarried, schooling, kind and amount of experience, name of recent employers, reference and salary expected. Address Machinist Instructor, Box 224, Temple Court Bldg., N. Y. City.

TOOL designer wanted—Two expert designers on tools, jigs, and fixtures; technical graduates preferred, with some shop experience. State age, nationality, education and experience. P-430, Am. Mach.

WANTED man with a number of years' experience in the manufacture of small copper, brass and bronze tubes. Splendid opportunity for the right man, who must be capable of taking charge of this department of our business and helping it to grow, and as it does grow his compensation would be increased accordingly. Plant located in the central part of New York State, in a city of approximately one hundred thousand population. Address P-427, Am. Mach.

Ohio

DESIGNERS and checkers accustomed to small intricate machine design. State salary and experience in first letter. The Daltan Adding Machine Co., Norwood, Cincinnati, Ohio.

TOOL-ROOM foreman must be expert on intricate die work. State salary and former connections in first letter. P-564, Am. Mach., Ohio.

WE have an opportunity for an expert time study man, capable of establishing methods as regards proper tooling and establishing a base for accurate cost records. He must be able to establish a bonus system throughout the plant which is in use in part of the plant at the present time. Unlimited field for a capable man to get in with a firm manufacturing standard parts. State salary desired, experience in full, and references in first letter, which will be absolutely confidential. Address P. O. Box 78, Youngstown, Ohio.

WANTED

TOOLMAKERS

First-class men on gage, jig, fixtures and tools. Wages 70 to 75 cents an hour, according to ability; eight-hour day, in one of the most modern, best equipped factories of its kind in the U. S. Located near Binghamton, N. Y. To those who can qualify we offer steady work the year around with a splendid opportunity for advancement. Apply by letter, giving all particulars as to experience, age and reference, to

Works Manager, International Time Recording Co. of N. Y.
Endicott, New York

The Engineering Agency,

(Incorporated)
1601-1662 Monadnock Block, Chicago

High-Grade
Technical MEN for Executive Engineering POSITIONS

Service Prompt and Confidential

NATIONAL EMPLOYMENT EXCHANGE

Officers and Directors:

Otto T. Bannard, President
John R. MacArthur
Vice President
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Secretary
Robert W. DeForest
L. F. Loree
Newcomb Carlton
Arthur Williams

30 Church Street New York City

G. S. Anthony
General Manager

WANTED

High Grade Mechanical Engineer

having had ample practical shop practice in addition to designing experience to justify him in assuming charge of Engineering Department of an organization engaged in manufacture of precision apparatus and automatic machine development work. A very desirable opening presents itself to a man who can positively qualify along the above lines.

Location—Newark, New Jersey.

Kindly outline your experience fully in answering.

P585—American Machinist
10th Ave. at 36th St., New York City

POSITION VACANT—OHIO

TOOL ROOM FOREMAN

WANTED

to take charge of tool room in plant manufacturing tractors, munition, and small interchangeable parts. Give age, reference and salary expected.

P259—Amer. Machinist
657 Leader-News Bldg., Cleveland, O.

There is a Searchlight Section in each of the following papers:

[1] **American Machinist**
[2] **Coal Age**
[3] **Electrical World**
[4] **Electrical Merchandising**
[5] **Electric Railway Journal**
[6] **Engineering and Mining Journal**
[7] **Engineering News-Record**
[8] **Chemical and Metallurgical Engineering**
[9] **Power**

Each of these 9 papers is the leading periodical of the industry it serves.

Searchlight advertisements will get you in touch with the important men of these important industries.

DRAFTSMAN WANTED

One good checker and draftsman, experienced on rubber machinery, in a newly organized department.

The Wellman-Seaver-Morgan Company
7000 Central Ave., Cleveland, Ohio

POSITION VACANT
WISCONSIN

MACHINE DESIGNER

Technical man, accurate and reliable, with a thorough knowledge of Machine Tool Design, to take charge of drafting room of about 25 men. Give full particulars in first letter. Location Wisconsin.

P544—American Machinist
1570 Old Colony Bldg., Chicago, Ill.

DRAFTSMEN

WANTED

Three or four thoroughly experienced reliable detail Draftsmen. State fully in your application salary expected, experience, age. To qualified men we offer permanent positions with good chance for advancement with the largest concern of its kind in the U. S. Preference will be given to men experienced on light automatic devices. Address reply

Works Manager, International Time Recording Co. of N. Y.
Endicott, N. Y.

Superintendent for Barrel Manufacturing

Out of town corporation wants a production man who has had experience in the manufacture of steel barrels of both light and heavy gauge steel. Must be familiar with double seaming operation and oxy-acetylene welding. A splendid opportunity for a high class man. Give full information in first letter, which will be treated in confidence.

P424—American Machinist
10th Ave. at 36th St., New York City

WANTED

A manufacturing company in west central Ohio offers an excellent opportunity as

FACTORY SUPERINTENDENT

to a man with ability to handle men and a practical knowledge of modern production methods.

State age, nationality and experience

P562—American Machinist
657 Leader-News Bldg., Cleveland, Ohio

POSITIONS VACANT

Pennsylvania

DRAFTSMAN wanted having had some experience in design of gas engines or air compressors. Good wages; steady work. Apply Chicago Pneumatic Tool Company, Franklin, Pa.

EXPERIENCED mechanical draftsman wanted for steam and gas engines, pumps and oil-well supply machinery. Must have at least 6 years' experience in drafting room and be able to design from sketches. State education, experience and salary required, and address Chief Draftsman, Oil Well Supply Co., Oil City, Pa.

FORGING estimator and correspondent. Experienced in drop forgings. Competent to sell. P-489, Am. Mach., Philadelphia.

FORGING estimator and sales correspondent. Experienced in flat die work or heavy forgings. P-486, Am. Mach., Philadelphia.

MAN experienced in drop forgings. Competent to study machinery operations, estimate and make drawings. P-490, Am. Mach., Phila.

STEEL record clerk. Competent to estimate billets, erquired for various sections for conversions. P-487, Am. Mach., Philadelphia.

STEEL sales manager. Familiar with bars, billets, etc. P-488, Am. Mach., Philadelphia.

South Carolina

MAN wanted who can tool up and operate National Acme & Cleveland Screw Machines. Permanent position and ideal working conditions. State when you could begin work and salary expected. P-537, Am. Mach., Philadelphia.

EMPLOYMENT AGENCIES

GENERAL engineering agency, Pittsburgh, Penn., requires experienced mechanical engineers, superintendents, master mechanics, general foremen, millwrights and draftsmen for excellent Eastern, Central and Western vacancies.

Employment Service

The undersigned provides a confidential service designed to locate openings through correspondence for men earning not less than $2500 and up to $25,000; all lines. Not an employment agency, but a constructive, initiative service, covering individual negotiations. Established 1910. Complete privacy assured; present connections in no way jeopardized. Send name and address only for explanatory details. R. W. Bixby, S64-66 Niagara Street, Buffalo, New York.

POSITIONS WANTED

Connecticut

EXECUTIVE engineer with successful record and wide experience seeks connection with reliable firm. Would consider bonus for results as part payment of $5000 salary. PW-530, Am. Mach.

FOREMAN grinder, 30 years' experience, both as operator and foreman. 10 years' in charge of grinding dept. with large automobile factory. 1 year in charge of cutter grinding in large arms plant; reference. PW-582, Am. Mach.

In Replying to "Blind" Ads

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10th Ave. at 36th St., New York.
935 Real Estate Trust Bldg., Phila.
657 Leader-News Bldg., Cleveland.
1570 Old Colony Bldg., Chicago.
519 Newhouse Bldg., Salt Lake City.
501 Rialto Bldg., San Francisco.

Important

Original letters of recommendation or other papers of value should not be enclosed to unknown correspondents—send copies.

POSITIONS WANTED

POSITION as superintendent, general foreman or master mechanic; American, 15 years' experience on fine gage, jig and fixture and general tool work requiring unusual accuracy. Thoroughly familiar with all detail work in connection with same. For reference and further information address PW-522, Am. Mach.

PRODUCTION superintendent, factory superintendent or general foreman, American citizen, 33, A. S. M. E., first-class mechanic, technical and commercial training, practical shop experience, central planning plant management. Good organizer and executive, very successful in handling and holding help. Seeks new manageemnt after January 1st, 1919. At present, holding responsible position PW-344, Am. Mach.

SITUATION wanted as superintendent or general foreman; American, 40. Practical mechanic, broad experience, good executive, systemizer and production man. Will go anywhere. PW-570, Am. Mach.

District of Columbia

DESIGN and production engineer, now Captain Engrs., U. S. AA., on design and purchase, special military apparatus available Jan. 20th. Civilian experience covers production of accurate interchangeable parts. PW-571, Am. Mach.

GRADUATE engineer, 3 years' thorough experience in purchasing and as office manager in machine shops desires similar position or as correspondent. Thoroughly familiar with interchangeable parts. New York location preferred. At present employed. PW-568, Am. Mach.

MANUFACTURERS, Attention! Now is the time to take the "kinks" out of your organization and methods. If you want to benefit by the experience of a man who has had 24 years in shop, drawing room and executive positions on a wide range of high-grade mechanical work write PW-528, Am. Mach.

Illinois

POSITION wanted, in or near Chicago, as assistant superintendent, production manager or superintendent, by married man, 37 years of age. Have been successful in installing piece-work, routing and follow-up systems. Experience and good record in all of the above mentioned capacities covering a period of 10 years. PW-550, Am. Mach., Chicago.

WORKS executive seeks new connection after January 1st in Middle Western States, 16 years' successful experience, agricultural implements, steam, gasoline and vacuum cleaning engines, electrical motors and apparatus. Now superintending 2000 employees, responsible for all manufacturing. That such reply may be made as will indicate whether or not it would be to our mutual advantage to get together, please to state generally what you have. Final arrangements by personal interview only. PW-527, Am. Mach., Chicago.

POSITIONS WANTED

Massachusetts

ASSISTANT mechanical engineer or superintendent; 15 years' experience tool and machine design, experimental and chief draftsman; technical education; age 35. PW-518, Am. Mach.

FACTORY or tool superintendent, production manager, general foreman, at present employed, available Dec. 15; 24 years' practical and technical experience on automobiles, motors, munitions, machine tools and equipment and maintenance, jigs and fixtures; varied production of interchangeable parts, cost and production system; an expert estimator; graduate R. I. School of Design; married; 42 years of age; A1 references. PW-432, Am. Mach.

INSPECTOR: Mechanic, 15 years shop plus 4 years specialist on inspection of patterns, forgings, castings, machine parts in progress and finished product. Expert on precision measurements. Jr. A. S. T. M. Sober, honest, diplomat, aggressive. Age 35, married. Wishes to represent reliable concern in eastern states as Inspector and Expediter. Experienced in meeting executives. References. Immediate connection. Write PW-578, Am. Mach.

TOOL engineer, executive; 18 years' experience in the design, making and development of tools, dies, fixtures and gages for the production of interchangeable parts desires to make a change. Salary, $2500. PW-514, Am. Mach.

Michigan

EXECUTIVE position wanted by practical man having filled positions as chief tool designer, supervising engineer, production manager and assistant factory manager. PW-541, Am. Mach., Detroit.

WORKS manager or superintendent; a practical executive with 21 years' experience, including tool making, tool and special machine designing, also as foreman, superintendent and works manager. Familiar with modern equipment and organization of new plants as well as successful operation of old. PW-524, Am. Mach., Chicago.

New Jersey

A WELL EDUCATED, refined lady, 32 years' of age, graduate nurse, is open for an engagement with a manufacturing establishment employing large numbers of female help. Is capable of taking full charge of supervision of personal and welfare work attached thereto. Is at present employed in a similar position, having charge of nearly 1000 girls. Desires to connect with a more progressive concern. Salary expected, $1800. Desires to be in the vicinity of New York City. Open for engagement January 1st. PW-476, Am. Mach.

MACHINE SHOP foreman, 31. A-1 mechanic and good executive; 16 years' practical and executive experience on tool and production lines. PW-574, Am. Mach.

MECHANICAL engineer, 32, desires position as chief draftsman, assistant to chief draftsman or mechanical engineer. 10 years' experience on tools, special and automatic machines. Thorough mechanic, inventive and executive ability. East preferred. PW-539, Am. Mach.

RECONSTRUCTION for new business will demand the attention of qualified mechanical engineer. Graduate mechanical engineer with 10 years' practical experience with several leading manufacturers now open for engagement. PW-511, Am. Mach.

(New York State)

WORKS MANAGER

37, technically trained, with thorough, practical experience in quality and quantity production of interchangeable parts and machinery at rock bottom cost and least expense. Efficient in administration, organization and handling help by means of centralized control and cost accounting. Salary $4200. Employed at present, but desires to make a change.

PW533—Am. Mach.
10th Ave. at 36th St., New York City

POSITION WANTED

PLANT MANAGER, PRODUCTION MANAGER or GENERAL SUPERINTENDENT

American born. Age 38.
Now employed as Plant Manager in full charge of Plant. Have general manufacturing experience in both light and heavy products: Heat Treating, Machine Shop, Forge Shop, Tin and Flat Metal Shop, Paint Shop and Assembly.
Can and have made good. Have sound judgment and will not disorganize your plant trying to make good. No question about remaining with present employer. Changing for purely personal reasons.

Address P. O. No. 6, Station B,
Buffalo, N. Y.

DO YOU REQUIRE

an American, thirty-two, technically educated, who is

AGGRESSIVE

Has been draftsman, machinist and engineer; is close student of human nature,

SUCCESSFUL

in handling men, money and material, now employed as

SUPERINTENDENT

and making good.

PW563—American Machinist
935 Real Estate Trust Bldg., Phila., Pa.

POSITION WANTED

FUEL OIL ENGINE DESIGNER

Can design and build Engines for Heavy Duty, Medium Speed, Stationary, continuous power purposes. Sizes ranging from 15 to 150 hp. Single cylinder, 2 cycle type. Suitable for Municipal, Factory, Irrigation and Oil Field Work. American born, age 33, married, graduate mechanical engineer, 9 years' experience, references. Desire to connect with strong, progressive concern.

PW546—American Machinist
1570 Old Colony Bldg., Chicago, Ill.

Keep your Eye
on the
Searchlight
and your
Advertisements in it

POSITIONS WANTED

FOREMAN (40) toolmaker by trade, technically trained, 20 years' shop experience, broad knowledge of gears, desires position. PW-497, Am. Mach.

ENERGETIC young mechanical draftsman, 5 years' experience on machine design, power and industrial plant layout and equipment, desires responsible position. PW-480, Am. Mach.

FIRST-CLASS tool and diemaker, 35 years old, with 18 years' practical experience, desires position as foreman of toolroom or machine shop. PW-551, Am. Mach.

EXECUTIVE position wanted by a mechanical engineer, practical machinist, systematizer, good centrifugal pump and tool designer. PW-494, Am. Mach.

MECHANICAL engineer, age 28, technical graduate, 5 years' practical experience, desires position in vicinity of New York, where industry is appreciated. References. PW-554, Am. Mach.

PRODUCTION Superintendent, 20 years' experience, special machinery, machine tools, jigs and fixtures, production work. Shop superintendent and chief draftsman thoroughly familiar with shop and foundry practices. Location immaterial. PW-491, Am. Mach.

PURCHASING agent or assistant. Young man, 28, single, just released from government service, with 12 years' experience in purchasing departments of machinery, automobile and motor truck industries, desires to connect with corporation in metal working organizations or kindred trades. PW-540, Am. Mach.

New York

DAAFTSMAN—technical young man, experienced, discharged from Army, desires position in or near New York. PW-577, Am. Mach.

TECHNICAL graduate, age 19, wishes position as draftsman and inspectro of production and gauges. PW-569, Am. Mach.

TECHNICAL graduate, age 22, 2 years' general shop and 3 years' marine drafting experience. Executive ability, ambitions and energetic, desires position with progressive firm. PW-580, Am. Mach.

YOUNG man, 29, at present and for past 1½ years with Ordnance Department U. S. Army in charge of production and inspection at private plant. All around mechanic and experienced industrial engineer. Would like to correspond with concerns considering installing production department in near future. Minimum salary, $2500. Location immaterial. PW-475, Am. Mach.

Ohio

FOREMAN with 22 years' experience on repairing and rebuilding machinery. Machine tool man. PW-542, Am. Mach., Leader-News Bldg., Cleveland.

PRACTICAL executive, employed at present in large motor plant as supervisor of tools and equipment, desires connection with a smaller plant, where an interest can be acquired and developed. Familiar with the design and manufacture of machine tools, gasoline engines and special machinery. American born, 37 years of age; in best of health. References from past employers and on pleasant terms with present boss. PW-509, Am. Mach., Leader-News Bldg., Cleveland.

POSITIONS WANTED

PRODUCTION engineer or chief tool designer desires position, wide experience as a production man and as a designer and factory executive. PW-481, Am. Mach., Cleveland.

Pennsylvania

ENGINEER, naturalized American, with 1st Class British Marine Engineers' Certificate, seeks position with some uptodate ship- and engine-building company. Unapproachable references for the building, erecting and installing of high-speed marine engine and turbines. PW-573, Am. Mach., Philadelphia.

EXPERT on automatic screw machines wants position. 26 years' mechanical experience and the past 14 pears foreman and assistant superintendent on production and building; at present on Government work. Will be at liberty Jan. 1st. PW-572, Am. Mach., Philadelphia.

FACTORY manager or general superintendent by man with extensive experience. One who thoroughly understands the human element in manufacturing, and how to organize and drill it upon a self-compelling basis. All problems between company and employee worked out in a constructive manner. Practical man; tools, dies and machinery. References. PW-552, Am. Mach., Phila.

FOREMAN or assistant superintendent; 15 years' executive experience in modern manufacturing methods for general machine work, special in tool machine manufacture, designing of tools and fixtures. PW-520, Am. Mach., Philadelphia.

ORGANIZING technical engineer and business executive just released from war work as plant manager concern making large production high-grade metal parts. Particularly skilled in coördination elements, attain high efficiency production and quality under difficult conditions. Salary prior to release, $8000. PW-515, Am. Mach., Leader-News Bldg., Cleveland.

South Dakota

AMERICAN—Mechanical and structural engineer, age 38, desires hard job as maintenance engineer or master mechanic. Earnings, $300. PW-538, Am. Mach., Chicago.

West Virginia

MANAGER or general superintendent—Position as manager or general superintendent, good mechanic and executive, clean record. Have successfully handled machine, blacksmith shop, tool room, foundry, office and kindred departments. PW-935, Am. Mach., Philadelphia.

Wisconsin

PRACTICAL and technical production engineer desires change, up-to-date on systems and shop practice; 18 years' experience. PW-521, Am. Mach., Chicago.

PRACTICAL-Technical production engineer now on Government truck and tractor motors. Will be through January first. Wants to connect with firm where production and costs are not satisfactory. Have doubled production in present position. Address Production Engineer, P. O. Box 149, Waukesha, Wis.

AGENTS AND SALESMEN

Do You Want Belgian Representation? "Three Belgian Engineers, builders and managers of mechanical engineerig works for the past 20 years, with important clientele amongst collieries, quarries, factories, forges and steelworks, experienced in the treatment of special steels and speaking English, desire to undertake agencies for American firms in Belgium. Will install large offices and depots. Guarantees given, if required. V. Lebeau, 21, Mount Ararat Road, Richmond, Surrey."

The SEARCHLIGHT SECTION

of McGraw-Hill Engineering Publications

Complete Service

A business paper that gives **complete** *service to an industry, does so in three ways:*

1

Its text pages furnish reliable information of up-to-the-minute progress and practice in the work of an industry.

2

Its advertising of manufacturers keeps readers informed of new and standard material, equipment and machinery.

3

Its Classified Advertising catalogs the current needs and special opportunities of an industry through the announcements of Employment and Business Opportunities, Second-Hand Equipment, Wanted and For Sale, etc.

What "Searchlight" Is

Recognizing fully both the special and associated value of all Classified advertisements, such announcements are grouped in one part of each McGraw-Hill paper called the "Searchlight" Section. The special appropriateness of this name centers in the fact that the thousands of copies of each paper carrying this advertising are synonymous with the rays of a searchlight. They search out for advertisers the prospective employers, employees, buyers or sellers with whom they can do business.

Special Circulation

And in the same sense that a searchlight typifies highly concentrated light so does the subscription list of each McGraw-Hill paper represent highly concentrated circulation as compared with the diffused circulation of newspapers and magazines.

Interested Readers

Each of the nine McGraw-Hill engineering publications is the representative business paper of the industry it serves. The men responsible as owners or managing executives for successful operation or maximum and efficient production and the ambitious and progressive "live wire" workers in these industries read these papers as a necessary part of their business equipment.

"Searchlight" Ads

When you want to do business with these men, the most direct and inexpensive means of getting your message before them is through their business paper. And when you are seeking or offering Employment, Second-hand Equipment or Business Opportunities, the advertising finds its logical place in the "Searchlight" Section—the nationally recognized center for such advertising.

And Then—Results

And that this advertising serves its purpose and accomplishes the desired results is evident from thousands of letters received from satisfied advertisers as well as from the fact that most of our copy is new in each issue—convincing evidence of the quick returns invariably received by "Searchlight" advertisers.

One McGraw-Hill paper carries 30 to 40 pages of this advertising each issue; two others 20 to 25; others 6 to 10. Naturally, the volume of this advertising from some industries is greater than from others but in each McGraw-Hill paper the "Searchlight" Section is the accepted means of communicating with the men of that industry.

To Serve You

When you want effective and inexpensive advertising in any of the ten fields covered by these papers, the "Searchlight" Section offers you an invaluable service for advertising.

Agencies Wanted
Agents Wanted
Auction Notices
Books and Periodicals
Buildings for Sale
Business Opportunities
Civil Service Opportunities
Contracts Wanted
Desk Room for Rent
Desk Room Wanted
Educational
Employment Agencies
Evening Work Wanted
Foreign Business
For Exchange
For Rent
Franchises
Industrial Sites
Labor Bureaus
Machine Shops
Machinery Wanted
New Industries Wanted
Partners Wanted
Patent Attorneys
Patents for Sale
Plants for Sale
Positions Vacant
Positions Wanted
Property for Sale
Receivers' Sales
Representatives Wanted
Salesmen Want Connections
Salesmen Wanted
Specialties
Tutoring
Vacation Work Wanted
Water Front Property
Work Wanted
Miscellaneous for Sale, for Rent or Want Ads.

EXPORT

Director of a London House

ESTABLISHED 40 YEARS

Now in the U.S.A. and returning to England shortly is desirous of communicating with several American concerns wishing energetic representation in Great Britain.

AS556—American Machinist
10th Ave. at 36th St., New York City

Exclusive Agency Wanted

by well-established New York jobber with sales force covering New York and vicinity for hardware, tools, marine, factory or contractors' supplies. Good facilities for carrying stock.

A & S583—Am. Mach.
10th Ave. at 36th St., New York City

Machinery Salesmen

WANTED

3 machine tool salesmen to sell machine tools and equipment on commission basis.

A & S584—Amer. Machinist
10th Ave. at 36th St., New York City

MANUFACTURER'S OPPORTUNITY

A large corporation manufacturing small tools and machines by punch press and screw machine processes wishes to add other products of similar character to their line, and would like to correspond with a man or a firm having such products and established markets. We will consider putting such man in charge of the manufacturing in our factory, or will consider the purchase of a firm's equipment, and the employment of one or more of those interested, together with their efficient workmen. Might also consider new devices if of great merit.

Post Office Box No. 918, St. Louis, Mo.

SALES AGENT

(LINGUIST)

Aggressive, young, responsible concern (linguist), knowing the domestic and export trade, would like to act as sales agent for manufacturers of machinery, metals or hardware. Highest references.

H. E., ROOM 1111
41 Cortlandt Street, New York City

BRASS FOUNDRY AND MACHINE SHOP

FOR SALE

This is a very modern foundry and machine shop, with a capacity of 6000 lb. of brass castings per day. Located in the southern part of the State of Michigan. Labor market is exceedingly good. For particulars address

BO507—American Machinist
1570 Old Colony Bldg., Chicago, Ill.

WANTED

STEEL AGENCIES

A well-established New England firm desires exclusive agencies for tool steel mill. Cold drawn screw stock and alloy steel mill and cold rolled strip mill in New England territory.

A & S560—American Machinist
10th Ave. at 36th St., New York City

FOR SALE

A FIRST-CLASS

TOOL AND STAMPING PLANT

IN CHICAGO

Capable of employing 40 to 50 men.

Machinery all new and of highest grade.

BO207—American Machinist,
1570 Old Colony Bldg., Chicago, Ill.

WELL-EQUIPPED MACHINE SHOP

specializing on small forging work that is to be machined, hardened and ground, wishes to negotiate rights to manufacture articles suited to their equipment that can be sold in large quantities.

BO558—American Machinist
1570 Old Colony Bldg., Chicago, Ill.

MACHINE TOOL SALESMAN

WANTED

Permanent position for first-class man to travel in New England representing manufacturer direct. In answering state age, experience, references, etc.

Address AS272—American Machinist
10th Ave. at 36th St., New York City

Peace Time Opportunity for Machine Shop

I would like to hear from parties who would be interested in financing the building and marketing of a machine tool of exceptional merit, which can be built in quantity and sold at special machine prices. This machine will do work automatically which now requires the very best of skilled labor. Its product is used very extensively by all motor car, tractor, aeroplane and truck builders; also many other metal working industries, both at home and abroad.

BO545—American Machinist
1570 Old Colony Bldg., Chicago, Ill.

AGENTS AND SALESMEN

Agencies Wanted in France

Chemist and engineer with technical and business experience in France and America would like to represent American manufacturers in France. AS-517, Am. Mach., Chicago.

Buying Agency For European Markets

"Progressive English house (well established) with works and London office, whose principal is now in America is prepared to meet principals of manufacturing concerns in the United States with view to arranging buying agency for any goods suitable for European markets. Already representing American concerns and can supply good references. Write AS-579, Am. Mach.

Wanted Reliable Salesman

Experienced in thrust and radial ball bearings. Give complete Record. AS-581, Am. Mach., Chicago.

Wants Position As Salesman

First-class toolmaker and machinist with some business training and 3 years' experience as salesman. AS-567, Am. Mach.

Tool Steel Salesman

For Chicago and vicinity, experienced in hardening and tempering high speed alloy and carbon tool steel. A splendid opportunity for man with personality, with well known manufacturer. State age, education, (names of schools) past employers and salary expected. Send photograph with application to AS-519, Am. Mach., Chicago.

EVENING WORK WANTED

General Machine Design and Drafting

At reasonable rates, accurate and rapid service. EW-576, Am. Mach.

PATENT ATTORNEYS

PATENTS. C. L. Parker, patent attorney, McGill Bldg., Washington, D. C. Inventor's handbook sent upon request.

BUSINESS OPPORTUNITIES

Newest Invention

Excellent opportunity offered for concern interested in building new type gear hobbing machines for spur, helical and spiral type bevel gears. Newest inventions in spiral bevel gear hobbing line, best machines on the market for future manufacturing. Apply A. Alexay, Avenel, N. J.

NOW! NOW! NOW!

Now is the time to sell machinery and material to the industries curtailed during war time. Equipment offered *now*, gets the benefit of present market prices and *immediate* demands.

You can reach the big buyers in the machinery field through

The Searchlight Section
of
American Machinist

"Searchlight" advertising is the big factor of recent years in the sale and exchange of used machinery. Buyers and sellers use it to equally good advantage:

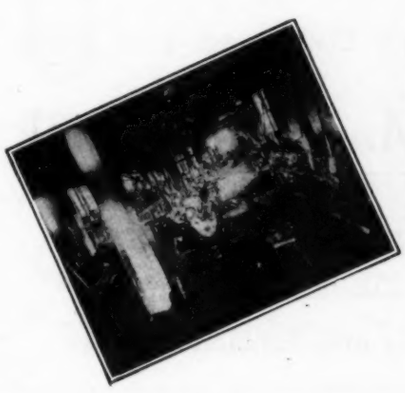
During war times it helped both government departments and private buyers to obtain necessary equipment; it enabled one advertiser to sell $4,800 worth of machinery through advertising that cost $12; another sold equipment for double the price he expected to get for it; another sold equipment through "Searchlight" advertising in less than a month, that has already been offered through other channels for over 8 months.

If YOU have surplus machinery or material on hand, NOW is the time to sell it—through the "Searchlight."

SEARCHLIGHT SERVICE SECURES SATISFACTORY SALES

FOR SALE

This Modern Factory Situated in Three Rivers, Que., Canada



Town of 25,000 population. Plant one-half mile from R.R. depot, one-quarter mile from St. Lawrence River wharf. On R.R. mail line, siding, 10 years tax exemption, nominal water rate, low insurance rate, unsprinkled, two floors reinforced concrete throughout, 15,000 sq. ft. floor space, maximum light, $75,000 latest Standard American Machine Tools which have just been completely overhauled, 120,000 sq. ft. land owned, 500,000 sq. ft. additional land optioned, level throughout, best labor district near Montreal, now operating, splendid opportunity as a Shell Plant or for any company desiring to retain its Canadian business after the war by avoiding the coming high import duties.

This plant can easily with present equipment turn out 200 to 250 4.5 or 4.7 shells, and over 400 only 18 pr. H.E. Shells per day.

We may consider selling machines en-bloc, renting the building on suitable terms.

LIST OF MACHINES

19—Lathes.
1—24-in. Butler B.G. Shaper.
1—24-in. x 24-in. x 8-ft. Cincinnati Heavy Pattern Planer.
1—No. 2 Cincinnati Cone-Type Universal Miller.
1—Fraser Cyl. Grinder.
1—2-ton Pneumatic Elevator.
1—6-in. x 8-ft. Accumulator.
1—18-in., 300-ton Hyd. Press.
1—50-hp. Motor.
1—30-hp. Motor.
1—7½-hp. Motor.
1—5-hp. Motor.
1—Dynamo.
1—Blower.
2—32-in. Mechanics' Upright Drills.
1—22-in. Barnes Upright Drill.
1—5-ft. Dreses Heavy Duty Radial Drill.
1—Lees & Braedner Thread Miller.
2—6-in. Cutting-Off Machines.
1—Monarch Nose Miller.
3—Grinders.
3—Sensitive Drills.
1—8-in. x 8-in. Compressor.
1—1¼-in. x 4 Triplex Hyd. Pump.
1—No. 300 A Oster Pipe Threader.
1—Band Press and Pump.
1—Marking Machine.
1—Racine Power Hack Saw.
1—Blacksmith Forge.
1—End Nosing Furnace.

Also Shop Tools, Jigs, Shafting, Belting, Pulleys, etc.

NO AGENTS

Mechanical Engineering Company, Limited, Three Rivers, Que.

or

MONTREAL OFFICE, Room 308, Bank of Toronto Building

Contract Work

SCREWS WORMS GEARS

Acme or Square Thread | Made to your specifications from your blue prints. Contract work only. | Spur Spiral Worm

ALLING-LANDER CO., INC., Sodus, N. Y.

DIES, TOOLS JIGS-FIXTURES
PRODUCTION WORK
CAPITAL DIE, TOOL & MACHINE CO.
619-21-N. Fourth St.
COLUMBUS, OHIO.

Contract Parts Manufacturers'
Complete Machines
Quantity Production

Have Complete Equipment Lathes, Turrets, Millers, Gear Cutters, Shapers, Carbonizing & Heat Treating

Mail Inquiries

GENERAL MACHINE WORKS
York, Pa.

Thread Milling by Contract

Special Machinery Designed and Built

Contract Machine Work
in a
Modern Up-to-date Shop

Prompt Deliveries and Efficient Service

THE GRAY MACHINE TOOL CO., Inc.
2651 Main Street, Buffalo, N. Y.

This way to high-grade Gauge Work, Punches and Dies.

Accuracy!—
That's what has characterized our 18 years of experience in this business. We use only the best materials.

Write for information

The Simplex Tool Co.
Woonsocket, R. I.

Accurate
Screw Machine Products
Prompt deliveries. Shop fully equipped with highest class new machines. Estimates cheerfully furnished.

Tock Screw Machine Products Corp.
199-203 Eighth Street, Long Island City, N. Y.

Precision Gauges, Tools, Machinery
Scientific Development of Inventions
AMERICAN STANDARD GAUGE CORP.
7-8 Chatham Square, New York City
Phone, Worth 9974

We are running on a peace basis. Are you ready?

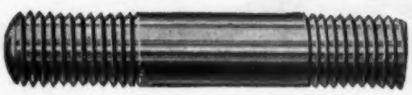
Special Machinery and Tool Jigs, Fixtures and Gauges. Experimental work our specialty.

G-K MACHINE & TOOL CO.
244 Greenwich St., New York, N. Y.

Sheffield Service

The Sheffield Machine & Tool Co. DAYTON, OHIO.

STUDS



What you want, when you want it at a price you can afford to pay—too good to believe? Well, tell us your requirements in the way of Milled Steel Studs, Bolts, Nuts, Screws, Washers, Screw Machine, Motor and Aeroplane Parts, and learn what we can do for you.

THE CINCINNATI SCREW CO.
Twightwee, Ohio (Cincinnati Suburb)

We specialize in the manufacture of

Dies, Jigs, Fixtures and Gauges

special machinery and tool designing. We solicit your inquiries. Send us blueprints and let us quote you.

WEBER & SCHER MFG. CO. **24 Scott St., Newark, N. J.**

LINCOLN MACHINE CO.

Light High Grade Machinery and Special Tools Made on Contract

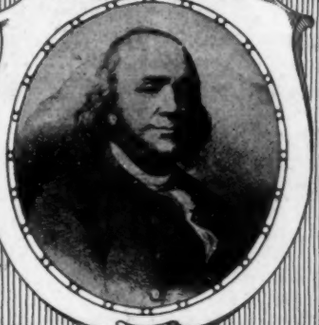
Manufacturers of Wrist Pins—Piston Pins—Shafts—Valve Lifting Mechanisms for Automobiles

Grinding of Hardened Parts to Precision Limits a Specialty

Send us your blueprints for estimate

Main and Carver Streets, Pawtucket, R. I., U. S. A.

FRANKLIN



Tools
Dies
Gauges
Fixtures

The Franklin Die-Tool Co. Columbus O.

WANTED
MACHINE WORK

We are in position to build complete machines or any parts. Operate own foundry. Send us your blueprints.

HERMANCE MACHINE CO.
Williamsport, Pa.

BRASS SCREW MACHINE PRODUCTS

Ranging from ¼ in. to 2½ in. diameter. We have large and excellent facilities, and if it can possibly be made on a screw machine, we can make it. Send us your blueprints or samples and we will quote you prices.

ANSONIA MFG. CO., Ansonia, Conn., U. S. A.

LET US DESIGN AND BUILD
YOUR

TOOLS, DIES JIGS and FIXTURES

All work guaranteed

THE BUDD-RANNEY ENGINEERING CO.
COLUMBUS, OHIO

SCHROEDER BROS. MFG. CO.

New Plant **TOOL MAKERS** **Low Overhead**

Let us make your Jigs and Fixtures, Dies, Gauges and other fine work.

TORRINGTON - - - CONN.

GAUGES JIGS TOOLS

Special Machinery

A Modern Manufacturing Plant

PERFECTION MACHINE WORKS, INC.
16 Norris Ave., Buffalo, N. Y.

SPECIAL MACHINERY
BUILT TO ORDER

We have splendid facilities for producing special machinery of all kinds, and are prepared to guarantee satisfaction—both as regards workmanship and price. We have foundry facilities and an up-to-date machine shop. Send us blue-prints and give us an opportunity to quote you price. We can save you money.

Lambert & Todd Machine Co., Camden, N. J.

Special Machinery Tool and Die Work on Contract

We are in position to take new contracts for all kinds of machine work, either parts or ma hines built outright Special machinery, **tool and die work our specialty.**

F. W. PERRY MACHINE COMPANY
YOUNGSTOWN, OHIO

Uncle Sam Needed 9400 Inspection Gauges in a Hurry

W.F.M. Co.

These gauges were for use on war material in a U. S. Arsenal. Their delivery meant the completion of highly necessary supplies. The order came to us and **we made delivery seventeen days ahead of contract time.**

This "Meyers Quality and Service" is at your disposal. Write or telegraph your needs.

Specifications:—Tool steel, 1/16-in. thickness, hardened, ground and lapped—four important dimensions. All underscored. No tolerance.

W. F. MEYERS COMPANY
Bedford, Indiana

CASTINGS

Semi-Steel **Grey Iron**
Unfilled capacity 30 tons per day.
Prompt deliveries. Write us.
FLOUR CITY O. IRON CO.
Minneapolis, Minn.

GWYNN Pittsburgh Pa

Light Manufacturing
of all kinds.
Screw Lathe, Milling, Shaper, Grinding Facilities
We solicit your inquiries
THE GWYNN ENGR. CO.
100-108 Liberty Ave., Pittsburgh, Pa.

THE WEST STEEL CASTING COMPANY
Cleveland, Ohio

Have foundry and machine shop capacity idle. Specialty, small steel castings and wheels of all forms up to 4 ft. in diameter. We have been on 100% Government work and must turn over to commercial business immediately. Have turning and boring mill work for 10/42-in. Niles and Bullard Boring Mills, 16/34-in. Gisholts.

WIRE OR PHONE US IF YOU HAVE WORK.

SMALL
STEEL CASTINGS
IMMEDIATE DELIVERY
Farrell-Cheek Steel Foundry Co
SANDUSKY, OHIO

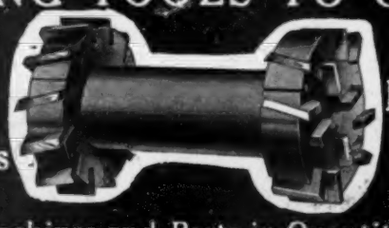
We Build Anything

in light and medium machinery, any quantity. Tools, Fixtures, Jigs and Dies for interchangeable production Experimental and model work.

Berggren & Pearson Machine Co.
Incorporated
221-227 Canal Street, New York City

CUTTING TOOLS TO ORDER

Milling Cutters End Mills



Reamers etc.

Machines and Parts in Quantity
Special Machinery Built to Order
We do the work the way you want it.

WORCESTER MACHINE WORKS
25 BARTLETT STREET, WORCESTER, MASS.

What do you do with the work that you can't do?

Do you turn down jobs right and left because you haven't the capacity to handle them?

You hate to turn work away because you realize what it means to you in profits lost today, and future business lost tomorrow. You think you can't handle a job because you can't promise deliveries, and because some of your departments are tied up now.

There is no need to lose this work. If it's one department that is tied up, let us relieve it. If it is the whole plant, let us do the whole job.

We'll do the work right and we'll do it on time.

Let's get together.

The Shop of a Hundred Experts

Hartford Special Machinery Company

287 Homestead Avenue, Hartford, Conn.

Castings and Machine Work

LARGE FACILITIES **PROMPT DELIVERIES**

We have a large foundry with traveling cranes and can handle your gray iron, brass and bronze castings, in accordance with Government specifications.

In our machine shop we can make your machines or parts in quantities promptly. We are especially qualified to handle pump, engine or marine work. Can take a good amount for hand turret machines, drill presses and tapping machines.

Write us your requirements and we will tell you what we can do.

W. & B. DOUGLAS, Middletown, Conn.

DIES

Forming, Blanking and Drawing Jigs—Fixtures

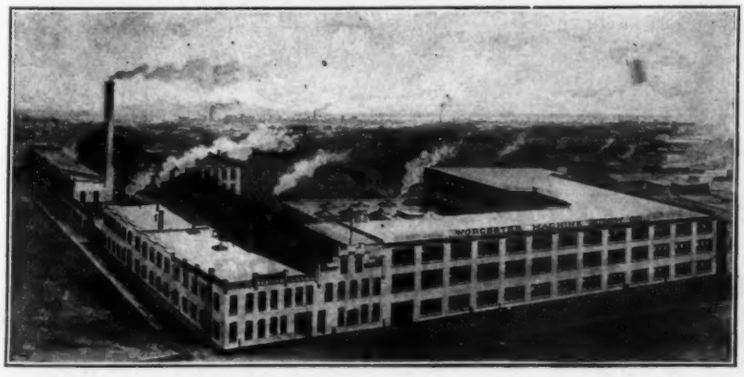
SUPERIOR TOOL & DIE WORKS
313 So. Clinton St., Chicago, Ill.

Screw Machine Products

Work up to 2¼ in. diameter can be handled with our increased facilities. Send us your specifications.

THOS. H. DALLETT CO., Philadelphia, Pa.

Worcester Machine Screw Co., Worcester, Mass.



Set Screws, Cap Screws, Machine Screws, Screw Machine Products

Machine Contract Work

WANTED

Thoroughly equipped with modern machine shops, we can render prompt and efficient service.
Special Machinery Building and Contract for Parts Solicited.

STRATTON & BRAGG CO., Petersburg, Va.

GRAY IRON CASTINGS

UP TO 10,000 LBS.

Write for Prices and Delivery

STRUCTURAL and SHEET STEEL WORK

GIFFORD-WOOD CO.

Main Office and Works: 2d Hill, Hudson, N.Y.
New York Boston Chicago
Buffalo Philadelphia

WHY not give us an opportunity to quote on your requirements for high grade screw machine products ⅛-in. to 3¾-in. capacity, light and heavy machine work, stampings and electro-galvanizing? Our facilities for QUANTITY PRODUCTION are at your disposal.

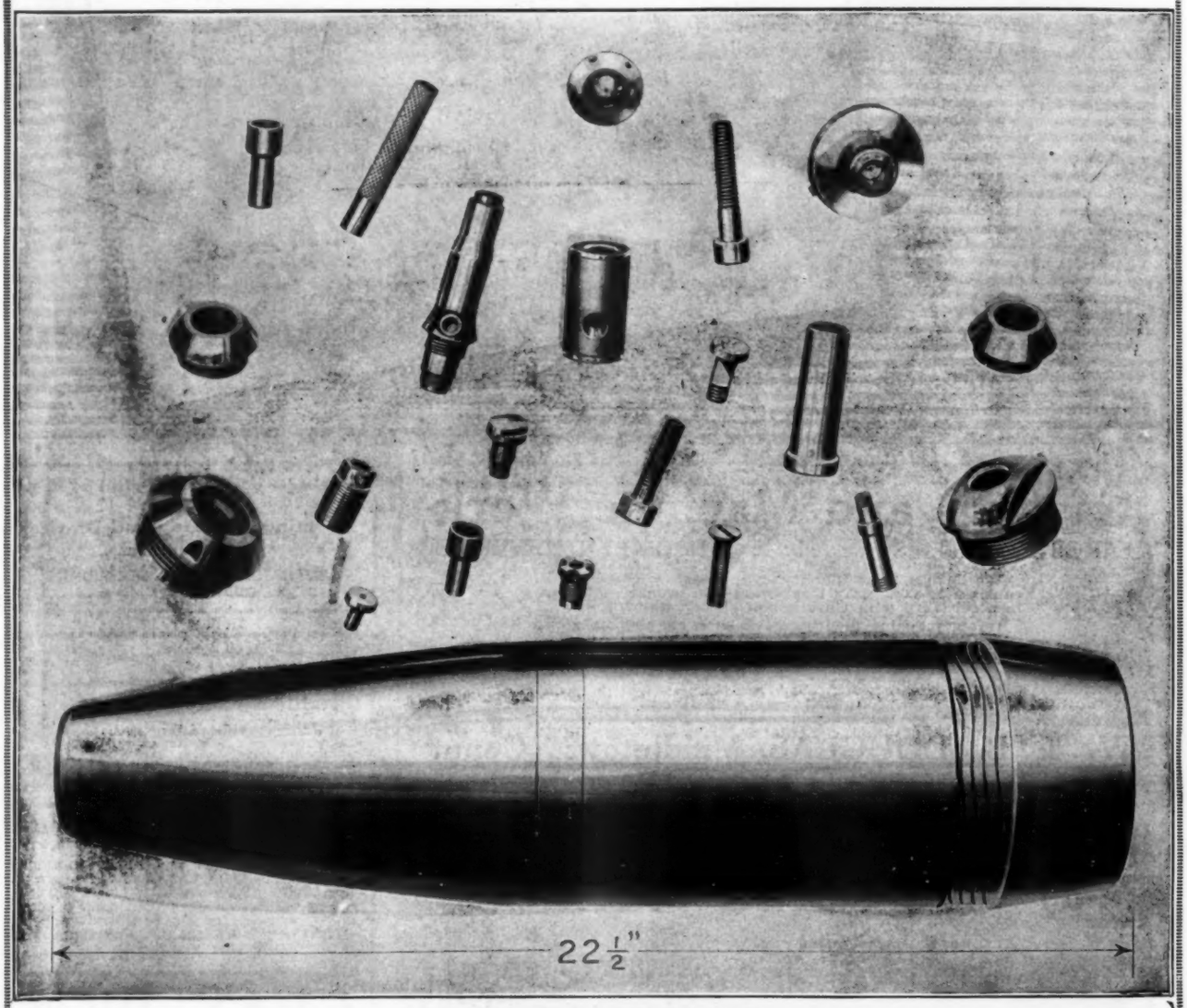


ILLUSTRATION OF SOME OF THE WORK WE HAVE BEEN DOING RECENTLY

For Accuracy and Prompt Delivery, Write

INTERNATIONAL ARMS & FUZE CO., INC.

Factories: BLOOMFIELD, NEW JERSEY MONTREAL, CANADA

TRADE MEHL MADE MARK

TOOLS
are the very
HEART
of the
MANUFACTURING BUSINESS

USE
TRADE MEHL MADE MARK
JIGS, FIXTURES, DIES,
& SPECIAL MACHINES

and keep the life-blood of your business in a healthy state.

Send for Circular Letter No. 1
Ask about that new Prospectus

MEHL MACHINE TOOL & DIE CO.
ROSELLE, N. J.
ESTABLISHED 1914

Largest and best equipped Factory in the World for manufacturing Automatic TOBACCO MACHINERY

OUR NEW PLANT

Also builders of high grade special and automatic Machinery, Jigs, Tools, Gauges and Fixtures

AMERICAN MACHINE & FOUNDRY COMPANY
Main Office and Factory: 5520 Second Avenue, Brooklyn, New York :: :: New York Office: 511 Fifth Avenue, New York

WANTED
Auto Screw Machine and Punch Press Work
We are in position to make any machine parts in quantity.
VOKEL ELECTRICAL MACHINE CO.
328 N. 15th St., Philadelphia, Pa.

GEO. F. BOWEN MACHINE COMPANY, Inc.
109-111 Tichenor Street, Newark, N. J.
(Formerly Wadell & Bowen Co., Inc.)
have doubled their capacity with a fully equipped shop and prepared to design and manufacture
Dies, Tools, Gauges, Jigs, Fixtures.
Accurate Work. Prompt Deliveries.

ACCURACY EFFICIENCY
Gauges Tools Dies — ROBBINS GAMWELL & CO. PITTSFIELD, MASS. — Special Machinery
ROBBINS, GAMWELL & CO.
Pittsfield, Mass.

The P-S mark on a drop forging is the final "O.K." stamp of a series of careful tests, extending from the receipt of the steel in our plant, to the shipping of the finished product.

Only in this way can we maintain the prestige which P-S Drop Forgings have gained in the past.

Page-Storms Drop Forge Co.
Chicopee, Mass.

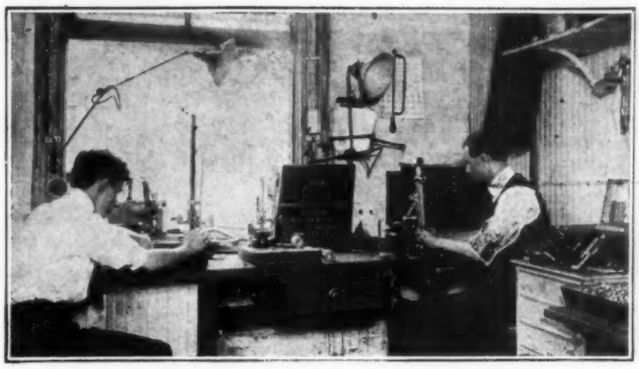
If You Are Near Williamsport, Pa.
why send to the other end of the earth to have your contract work done? We can make your special machinery and parts and save you capital invested in new machinery by doing your medium and heavy Planing, Turning, Boring and J. & L. Screw Machine work. What can we do for you
Shepherd Engineering Co., Williamsport, Pa.

High Grade Tools and Dies
Jigs, Gauges and Fixtures. Special Machinery Designed and Built. Light Manufacturing and Stamping Work.
Western Tool and Machine Works, Inc.
127 N. 5th Ave., Chicago, Ill.

BRASS and METAL WORK
We are equipped to take on contractwork in large or small quantities such as:
Brass Castings, Valve Parts, Machined Work, Airplane Parts, Electro Plating, Fittings, Instrument Parts, Tubes, Sheets Rods, Timer, Tool Attachments, Name Plates, Metal Work, etc.

The NEWMAN MFG. COMPANY
Established 1882 Cincinnati, Ohio

OUR SURPLUS STOCK OF NEW
HOT ROLLEDPICKLED STRIPAND COLD ROLLED STRIP STEELS FOR SALE
SEND US YOUR INQUIRIES
KALES STAMPING COMPANY, 453 Lafayette Blvd., DETROIT



Partial View of Inspection Room

OUR machine equipment and our experience enables us to supply all classes of accurate Tools, Gauges, Dies and similar products.

We are also equipped for quantity production.

FRED'K PEARCE CO.,

18-20 Rose Street, New York, N. Y.

Established 1872 Beekman 992

PRODUCTION DEVELOPMENT

NOW AT YOUR DISPOSAL

¶ Do you want to start your peace time production in a hurry?

¶ Do you want a tool room with a hundred experts supported by trained engineers and the ultimate in equipment ?

¶ Do you want the extreme in accuracy, interchangeability, and low cost in your product?

¶ When we finish our work for Uncle Sam's small arms, airplanes and munitions, we can turn this mighty force into your business. Why not write us today?—or 'phone, Branch Brook 1290.

BEAVER MACHINE AND TOOL COMPANY

625-643 North Third Street

NEWARK, N. J.

E. G. MUNSON, Utica, N. Y.

GREY IRON CASTINGS

PATTERN WORK (Wood & Iron)

MACHINE WORK

The building and mounting of patterns for moulding machines a specialty.

DIES, JIGS, GAUGES, SPECIAL FIXTURES, TOOLS, ETC.

WILCOX MOTOR & MFG. CO.

Inventors — Experimenters

have your ideas developed by experts. Our up-to-date plant is ready for contracts on light manufacturing, tools, jigs, fixtures, etc.

NAUTICAL INSTRUMENT MFG. CO.
47-49 West Street, New York City

Again Ready

for

Contract Work

SPECIAL MACHINERY
Jigs and Fixtures

Designed and built at reasonable prices.

PRODUCTION WORK WANTED

Thoroughly Modern Machine Shop with unusual Foundry Facilities.

Write us Today

THE REYNOLDS MACHINE CO.

Massillon Dept. M. Ohio

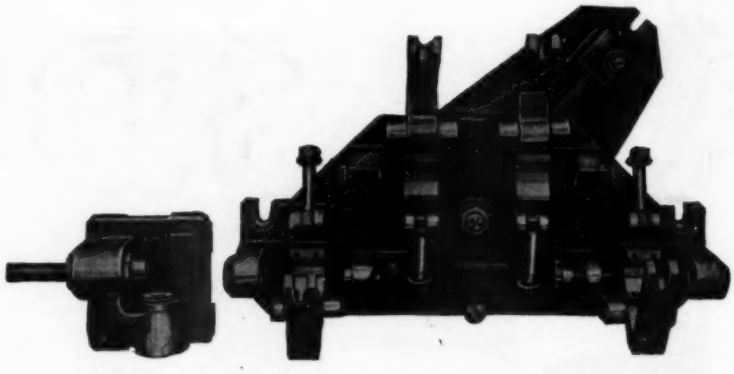
TOOL ROOM PRODUCTS TRADE MARK

DIES JIGS GAUGES

Fixtures, Special Tools, Tool Designing.
Special Machinery and Sheet Metal Stampings.
Pronounced Accuracy—Send Us Your Orders.

MOORE & CO. Grand Ave & Franklin St. Chicago

Get in touch with us for *High Class*



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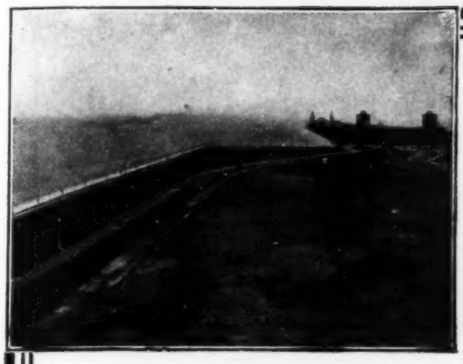

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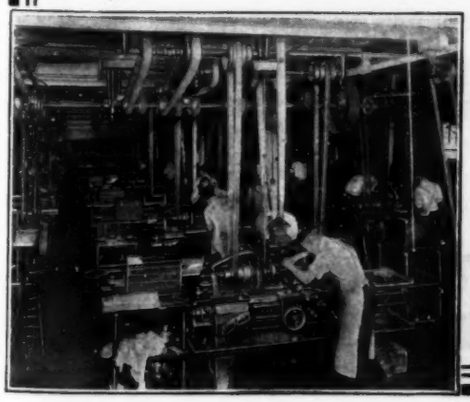

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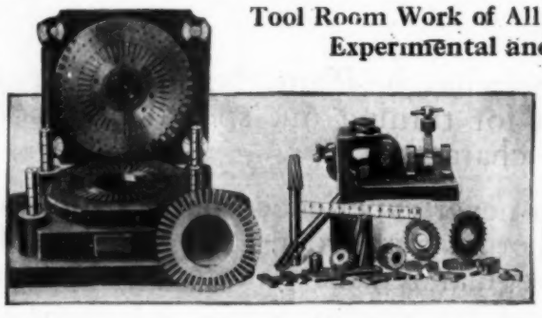

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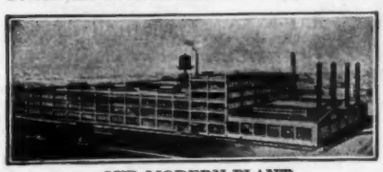

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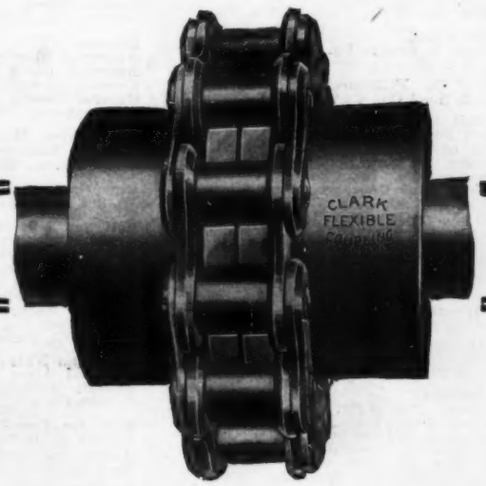

WHAT AND WHERE TO BUY

Equipment and Supplies Used in Machine Shops with Names of Manufacturers

Abrasive Discs
Besly & Co., Charles H., Chicago, Ill.
Gardner Machine Co., Beloit, Wis.

Abrasive Materials
Abrasive Co., Brideasburg, Phila., Pa.
Dickinson, Thos. L., 64 Nassau St., N. Y.
Gardner Machine Co., Beloit, Wis.
Hampden Corundum Wheel Co., Springfield, Mass.
Maxf Grinding Wheel Corp., Chester, Mass.
Norton Co., Worcester, Mass.
Safety Emery Wheel Co., Springfield, Ohio.
Vitrified Wheel Co., Westfield, Mass.

Accumulators, Hydraulic
Elmes Engineering Wks., Chas. F., Chicago.

Agents, Foreign
Watson-Stillman Co., 42 Church St., N. Y.
Worthington Pump & Machinery Corp., N. Y.

Air Lifts
Ingersoll-Rand Co., 11 Broadway, N. Y.
Sullivan Machinery Co., Chicago, Ill.
Worthington Pump & Machinery Corp., N. Y.

Air Purifiers and Coolers
Worthington Pump & Machinery Corp., N. Y.

Alloys, Special
Driver-Harris Co., Harrison, N. J.

Analyses, Chemical
Souther Engineering Corp., Hy., Hartford, Conn.

Angle Plates
Boston Scale & Machine Co., Boston.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

Arbors
Cincinnati Milling Machine Co., Cincinnati, O.
Cleveland Twist Drill Co., Cleveland, Ohio.
Cushman Chuck Co., Hartford, Conn.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Detroit, Mich.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Union Mfg. Co., New Britain, Conn.
Whitney Mfg. Co., Hartford, Conn.

Babbitt Metal
Ajax Metal Co., Phila., Pa.

Balancing Machines
Norton Grinding Co., Worcester, Mass.

Balancing Ways
Anderson Bros. Mfg. Co., Rockford, Ill
Norton Grinding Co., Worcester, Mass.

Ball Retainers
Bearings Co. of America, Lancaster, Pa.

Balls, Brass, Bronze and Steel
Abbott Ball Co., Box 1233, Hartford, Conn.
Auburn Ball Bearing Co., Rochester, N. Y.
Baker & Co., H., 101 Duane St., N. Y. City.
Gwilliam Co., 253 W. 58th St., N. Y. C.
Hoover Steel Ball Co., Ann Arbor, Mich.
New Departure Mfg. Co., Bristol, Conn.

Barrels, Tumbling
Abbott Ball Co., Box 1233, Hartford, Conn.
Globe Machine & Stamping Co., Cleveland.
Whiting Foundry Equipment Co., Harvey, Ill.

Bars, Boring
Cleveland Twist Drill Co., Cleveland, Ohio.
Gisholt Machine Co., Madison, Wis.
Marvin & Casler Co., Canastota, N. Y.
Underwood & Co., H. B., Philadelphia, Pa.

Bars, Bronze Cored
Bunting Brass & Bronze Co., Toledo, Ohio.

Bars, Steel
Carnegie Steel Co., Pittsburgh, Pa.
Elyria Iron & Steel Co., Cleveland, Ohio.

Bearings, Ball
Auburn Ball Bearing Co., Rochester, N. Y.
Bearings Co. of America, Lancaster, Pa.
Fafnir Bearing Co., New Britain, Conn.
Federal Bearings Co., Inc., Poughkeepsie, N. Y.
Gurney Ball Bearing Co., Jamestown, N. Y.
Gwilliam Co., 253 W. 58th St., N. Y. C.
Hess-Bright Mfg. Co., Philadelphia, Pa.
New Departure Manufacturing Co., Bristol, Conn.
Norma Co. of America, 1790 Broadway, N. Y. C.
Standard Roller Bearing Co., Phila., Pa.
Transmission Ball Bearing Co., Buffalo, N. Y.
U. S. Ball Bearing Co., Chicago, Ill.

Bearings, Bronze
Edna Brass Mfg. Co., Cincinnati.

Bearings, Die-Cast
Acme Die Casting Corp., Brooklyn, N. Y.
Light Mfg. & Foundry Co., Pittsburgh, Pa.

Bearings, Journal
Ajax Metal Co., Phila., Pa.
Arguto Oilless Bearing Co., Phila., Penn.
Bunting Brass & Bronze Co., Toledo, Ohio.
Columbus Brass Co., Columbus, Ohio.
Laminated Shim Co., 533 Canal St., N. Y. C.
Mass. Oilless Bearing Co., Worcester, Mass.
Sterling Specialty Co., Newcomers[illegible] Ohio.

Bearings, Roller
Gwilliam Co., 253 W. 58th St., N. Y. C.
Hyatt Roller Bearing Co., Harrison, N. J.
Norma Co. of America, 1790 Broadway, N. Y. C.
Royersford Fdry. & Mach. Co., Royersford, Pa.

Belt Cement
Dixon Crucible Co., Joseph, Jersey City, N. J.
Graton & Knight Mfg. Co., Worcester, Mass.
Ladew Co., Edw. R., Glen Cove, N. Y.
Schieren Co., Chas. A., 41 Ferry St., N. Y. City.
Standard Roller Bearing Co., Phila., Pa.

Belt Clamps
Hoggson & Pettis Mfg. Co., New Haven, Conn.

Belt Dressings and Fillers
Dixon Crucible Co., Joseph, Jersey City, N. J.
Graton & Knight Mfg. Co., Worcester, Mass.
Ladew Co., Edw. R., Glen Cove, N. Y.
Schieren Co., Chas. A., 41 Ferry St., N. Y. City.
Texas Co., 17 Battery Place, N. Y.
White & Bagley Co., Worcester, Mass.

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Clipper Belt Lacer Co., Grand Rapids, Mich.

Belt Lacing
Chicago Rawhide Mfg. Co., Chicago, Ill.
Graton & Knight Mfg. Co., Worcester, Mass
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Belt Lacing Machines
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.

Belt Shifters
LeBlond Mach. Tool Co., The, R. K., Cincinnati.

Belting, Chain
Caldwell & Son Co., H. W., Chicago, Ill.
Link-Belt Co., Chicago, Philadelphia.
Morse Chain Co., Ithaca, N. Y.
Whitney Mfg. Co., Hartford, Conn.

Belting, Endless
Brown Mfg. Co., Arthur S., Tilton, N. H
Gilmer & Co., L. H., Tacony, Philadelphia.

Belting, Leather
Chicago Rawhide Mfg. Co., Chicago, Ill.
Graton & Knight Mfg. Co., Worcester, Mass.
N. Y. Leather Belting Co., Worcester, Mass.
Rhoads & Sons, J. E., 32 N. 3rd St., Phila, Pa.
Schieren Co., Chas. A., 41 Ferry St., N. Y. City.

Belts, Abrasive
Blevney Mach. Co., Greenfield, Mass.

Benches, Work
Manufacturing Equipment & Engineering Co., Framingham, Mass.
New Britain Machine Co., New Britain, Conn
Western Tool & Mfg. Co., Springfield, Ohio

Bench Legs
Garwood Bronze & Iron Works, Garwood, N. J.
Manufacturing Equipment & Engineering Co., Framingham, Mass.
New Britain Mach. Co., New Britain, Conn

Bending Machines, Power
Long & Allstatter Co., Hamilton, Ohio.
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.
Toledo Mach. & Tool Co., Toledo, Ohio.

Blocks, Arbor Driving
Nicholson & Co., W. H., Wilkes-Barre, Penn.

Blocks, Chain (See Hoists, Hand)

Blocks, Die
Halcomb Steel Co., Syracuse, N. Y.

Blocks, Pillow
Gurney Ball Bearing Co., Jamestown, N. Y.

Blowers
American Blower Co., Detroit, Mich.
American Gas Furnace Co., 24 John St., N. Y. C.
Chicago Flexible Shaft Co., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

Blueprinting Machinery
Buckeye Engine Co., Salem, Ohio.
Wickes Bros., Saginaw, Mich.

Blueprints
Wickes Bros., Saginaw, Mich.

Bolt and Nut Machinery
Acme Machinery Co., Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
Landis Machine Co., Waynesboro, Pa.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ohio.
Newton Mach. Tool Wks., Philadelphia, Penn.
Victor Tool Co., Waynesboro, Penn.
Webster & Perks Tool Co., Springfield, Ohio.

Bolts and Nuts
National Acme Co., Cleveland, Ohio.
Russell Burdsall & Ward Bolt and Nut Co., Port Chester, N. Y.

Bone for Case-Hardening
Rogers & Hubbard Co., Middletown, Conn.

Books, Technical
McGraw-Hill Book Co., 239 W. 39th St., N. Y. C.

Boosters
Crocker-Wheeler Co., Ampere, N. J.
General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

Boring and Turning Mills, Vertical
Betts Machine Co., Rochester, N. Y.
Bickford & Co., H., Lakeport, N. H.
Bullard Machine Tool Co., Bridgeport, Conn.
Cincinnati Planer Co., Cincinnati, Ohio.
Colburn Mach. Tool Co., Franklin, Penn.
Gisholt Mach. Co., Madison, Wis.
King Mach. Tool Co., Cincinnati, O.
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.
Sellers & Co., Wm., Philadelphia, Penn

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Barnes Co., W. F. & John, Rockford, Ill.
Beaman & Smith Co., Providence.
Betts Machine Co., Rochester, N. Y.
Dale-Brewster Machinery Co., Chicago, Ill.
Cleveland Mach. Tool Co., Cleveland.
Gidding & Lewis Mfg. Co., Fond du Lac, Wis.
Gisholt Machine Co., Madison, Wis.
Hoefer Mfg. Co., Freeport, Ill.
Lucas Machine Tool Co., Cleveland.
Moline Tool Co., Moline, Ill.
Newton Mach. Tool Wks., Philadelphia, Penn.
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.
Pawling & Harnischfeger Co., Milwaukee, Wis.
Prentiss & Co., Henry, Singer Bldg., N. Y. City.
Rockford Drilling Mach. Co., Rockford, Ill.
Sellers & Co., Wm., Philadelphia, Penn.
Springfield Machine Tool Co., Springfield, Ohio
Universal Boring Machine Co., Hudson, Mass.
Vandyck Churchill Co., 93 Liberty St., N. Y. C.

Boring, Drilling and Milling Mach., Vert.
Betts Machine Co., Rochester, N. Y.

Boring Heads
Davis Boring Tool Co., St. Louis, Mo.
Marvin & Casler Co., Canastota, N. Y.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Waterston, J. M., 77 Woodward Ave., Detroit.

Boring Tools
Armstrong Bros. Tool Co., Chicago.
Davis Boring Tool Co., St. Louis.
Lovejoy Tool Co., Springfield, Vt.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Union Tool Co., Orange, Mass.
Western Tool & Mfg. Co., Springfield, Ohio.
Williams & Co., J. H., Brooklyn, N. Y. City.

Boxes, Tote (See Furniture, Machine Shop)

Broaches
Lapointe Co., J. N., New London, Conn.
Lapointe Machine Tool Co., Hudson, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

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Lapointe Co., J. N., New London, Conn
Lapointe Machine Tool Co., Hudson, Mass.

Bronze
Lumen Bearing Co., Buffalo.

Brushes
Dixon Crucible Co., Joseph, Jersey City, N. J.

Bucket Carriers, Pivoted
Link-Belt Co., Chicago, Philadelphia.

Buffing or Polishing Machine (See Polishing and Buffing Machines)

Bulldozers
Bellevue Industrial Furnace Co., Detroit, Mich.
Long & Allstatter Co., Hamilton, Ohio.
Toledo Mach. & Tool Co., Toledo, Ohio.

Burners, Oil and Gas
Bellevue Industrial Furnace Co., Detroit, Mich.
Best, W. N., 11 Broadway, N. Y. City.
Gilbert & Barker Mfg. Co., Springfield, Mass.
Johnson Gas Appliance Co., Cedar Rapids, Iowa.

Bushings
Bunting Brass & Bronze Co., Toledo, Ohio.
Columbus Brass Co., Columbus, Ohio.
Diamond State Fibre Co., Bridgeport, Pa.
Edna Brass Mfg. Co., Cincinnati, Ohio.
Lumen Bearing Co., Buffalo, N. Y.
Phosphor Bronze Smelting Co., Philadelphia, Pa.
Sterling Specialty Co., Newcomerstown, Ohio.

Cabinets, Tool
Armstrong Bros. Tool Co., Chicago.

Calipers
Athol Machine Co., Athol, Mass.
Randall & Stickney, Waltham, Mass.
Slocomb Co., J. T., Providence.
Starrett Co., L. S., Athol, Mass.
Union Tool Co., Orange, Mass.

Cam Cutting Machines
Garvin Machine Co., N. Y. City.
Rowbottom Machine Co., Waterbury, Conn.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

Cams
Rowbottom Machine Co., Waterbury, Conn.

Can-Making Machinery (See Sheet Metal Working Machinery)

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Bunting Brass & Bronze Co., Toledo, Ohio.
Doehler Die Casting Co., Brooklyn, N. Y.
Light Mfg. & Foundry Co., Pottstown, Penn.

Castings, Brass and Bronze
Bunting Brass & Bronze Co., Toledo, Ohio.
Columbus Brass Co., Columbus, Ohio.
Doehler Die Casting Co., Brooklyn, N. Y.
Douglas, W. & B., Middletown, Ct.
Edna Brass Mfg. Co., Cincinnati, Ohio.
Imperial Brass Mfg. Co., Chicago.
Light Mfg. & Foundry Co., Pottstown, Penn.
Lumen Bearing Co., Buffalo, N. Y.

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HOOVER STEEL BALL CO.
Ann Arbor, Mich., U. S. A.

Phosphor Bronze & Smelting Co., Philadelphia.
Castings, Die Molded
Doehler Die Castings Co., Brooklyn, N. Y.
Light Mfg. & Foundry Co., Pottstown, Penn.
Lumen Bearing Co., Buffalo, N. Y.
National Lead Co., 111 Broadway, N. Y.

Castings, Iron
Athol Machine Co., Athol, Mass.
Birdsboro Steel Fdy. & Mach. Co., Birdsboro, Pa.
Brown & Sharpe Mfg. Co., Providence.
Chisholm-Moore Mfg. Co., Cleveland, Ohio.
Douglas, W. & B., Middletown, Conn.
Farrell Fouadry & Machine Co., Ansonia, Conn.
Flour City O. Iron Co., Minneapolis, Minn.
Munson, E. G., Utica, N. Y.
Springfield Mach. Tool Co., Springfield, Ohio.

Castings, Nichrome
Driver-Harris Co., Harrison, N. J.

Castings, Semi-Steel
Farrell Fdy. & Mach. Co., Ansonia, Conn.
Springfield Mach. Tool Co., Springfield, Ohio.

Castings, Steel
Farrell-Cheek Steel Foundry Co., Sandusky, O.
Sivyer Steel Casting Co., Milwaukee, Wis.

Cements, Iron
Felton, Sibley & Co., Inc., Philadelphia, Pa.
Hilo Varnish Corporation, Brooklyn, N. Y.
Smooth-On Mfg. Co., Jersey City, N. J.

Centering Machines
Hendey Mach. Co., Torrington, Ct.
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.
Whiton Mach. Co., D. E., New London, Conn.

Centers, Planer
Cincinnati Planer Co., Cincinnati.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Woodward & Powell Planer Co., Worcester.

Chains (See Sprockets and Chains)

Chain, Driving
Baldwin Chain & Mfg. Co., Worcester, Mass.
Boston Gear Wks., Norfolk Downs, Quincy, Mass.
Link-Belt Co., Philadelphia, Chicago.
Morse Chain Co., Ithaca, N. Y.
Whitney Mfg. Co., Hartford, Conn.

Chasers
Bay State Tap & Die Co., Mansfield, Mass

Chemists
Souther Engineering Corp., Hy., Hartford, Conn.

Chucking Machines, Automatic
Bullard Machine Tool Co., Bridgeport, Conn.
Cleveland Auto Mach. Co., Cleveland.
Gisholt Machine Co., Madison, Wis.
New Britain Machine Co., New Britain, Conn.
Potter & Johnston Mach. Co., Pawtucket, R. I.
Warner & Swasey Co., Cleveland.

Chucking Machines (See Lathes, Horizontal Turret and Vertical Turret)

Chucks, Centering
Carroll-Jamieson Mach. Tool Co., Batavia, Ohio.
Cushman Chuck Co., Hartford, Conn.
King Machine Tool Co., Cincinnati, O.

Chucks, Drill and Tap
Almond Mfg. Co., T. R. Ashburnham, Mass.
Bicknell-Thomas Co., Greenfield, Mass.
Clark Equipment Co., Buchanan, Mich.
Cleveland Twist Drill Co., Cleveland, Ohio.
Cushman Chuck Co., Hartford, Conn.
Eastern Tube & Tool Co., Brooklyn, N. Y.
Hammacher, Schlemmer & Co., N. Y. City.
Horton & Son Co., E., Windsor Locks, Conn
Jacobs Mfg. Co., Hartford, Conn.
Manufacturers Equipment Co., Chicago, Ill.
Modern Mfg. Co., Bridgeport, Conn.
Modern Tool Co., Erie, Penn.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Detroit.
Neidow & Payson Co., 9 So. Clinton St., Chicago.
Peter Bros. Mfg. Co., Algonquin, Ill.
Scully-Jones Co., 649 Railway Exc., Chicago.
Skinner Chuck Co., New Britain, Conn.
Standard Tool Co., Cleveland, Ohio.
Swedish Gage Co., 245 W. 55th St., N. Y. City.
Union Mfg. Co., New Britain, Conn.
Victor Tool Co., Waynesboro, Penn.
Wahlstrom Tool Co., Brooklyn, N. Y.
Whitney Mfg. Co., Hartford, Conn.
Whiton Mach. Co., D. E., New London, Conn.

Chucks, Lathe
Advance Tool Co., Cincinnati, Ohio.
Almond Mfg. Co., T. R., Ashburnham, Mass.
Bullard Machine Tool Co., Bridgeport, Conn.
Cushman Chuck Co., Hartford, Conn.
Gisholt Mach. Co., Madison, Wis.
Hoggson & Pettis Mfg. Co., New Haven, Conn.
Horton &Son Co., E., Windsor Locks, Conn.
Manufacturers Equipment Co., Chicago, Ill.
Neidow & Payson Co., 9 So. Clinton St., Chicago.
Newman Mfg. Co., 717 Sycamore St., Cincinnati.
Simplex Tool Co., Woonsocket, R. I.
Skinner Chuck Co., New Britain, Conn.
Thomas Elevator Co., 20 S. Hoyne Ave., Chicago.
Union Mfg. Co., New Britain, Conn.
Whiton Mach. Co., D. E., New London, Conn.

Chucks, Magnetic
D & W Fuse Co., Providence.
Heald Mach. Co., Worcester, Mass.
Persons-Arter Mach. Co., Worcester, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Walker Co., O. S., Worcester, Mass.

Chucks, Planer
Cincinnati Planer Co., Cincinnati, Ohio.
D & W Fuse Co., Providence.
Hoggson & Pettis Mfg. Co., New Haven, Conn.
Horton & Son Co., Windsor Locks, Conn.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Walker Co., O. S., Worcester, Mass.

Chucks, Split
Ames Co., B. C., Waltham, Mass.
Seneca Falls Mfg. Co., Seneca Falls, N. Y.
Sloan & Chace Mfg. Co., Newark, N. J.
Stark Tool Co., Waltham, Mass.

Chucks, Vertical Boring Mill
Bullard Machine Tool Co., Bridgeport, Conn.
Gisholt Machine Co., Madison, Wis.

Clamps, Machinists'
Armstrong Bros. Tool Co., Chicago.
Brown & Sharpe Mfg. Co., Providence, R. I.
Hammacher, Schlemmer & Co., N. Y. City.
Reed Mfg. Co., Erie, Penn.
Starrett Co., L. S., Athol, Mass.
Williams & Co., J. H., 35 Richards St., Brooklyn.

Cleaners, Metal, Waste, General
Oakley Chemical Co., 24 Thames St., N. Y. City.

Clocks, Time
Calculagraph Co., 30 Church St., N. Y. City.
Gisholt Machine Co., Madison, Wis.
Lux Clock Mfg. Co., Waterbury, Conn.

Clutches, Friction
Bicknell-Thomas Co., Greenfield, Mass.
Blevney Machine Co., Greenfield, Mass.
Brown Co., A. & F., 79 Barclay St., N. Y. City.
Brown Engineering Co., Reading, Penn.
Hilliard Clutch & Mchry. Co., Elmira, N. Y.
Link-Belt Co., Chicago, Philadelphia.
Moore & White Co., Phila., Pa.
Osterlein Machine Co., Cincinnati, Ohio.
Transmission Ball Bearing Co., Buffalo, N. Y.

Coal and Ash Handling Machinery
Caldwell & Sons Co., H. W., Chicago.
Link-Belt Co., Chicago, Philadelphia.
Shepard Electric C. & H. Co., Montour Falls, N. Y.

Coal-Storage Systems
Link-Belt Co., Chicago, Philadelphia.

Coils, Electrical
D & W Fuse Co., Providence, R. I.
General Electric Co., Schenectady, N. Y.

Collars, Spacing
Detroit Stamping Co., 951 W. Fort St., Detroit.
Scully-Jones Co., 649 Railway Exc., Chicago.

Collets
Bay State Tap & Die Co., Mansfield, Mass.
Modern Tool Co., Erie, Penn.
Rivett Lathe & Grinder Co., Brighton, Boston
Union Twist Drill Co., Athol, Mass.
Whitney Mfg. Hartford, Conn.

Compounds, Carbonizing, Casehardening and Tempering
Bennett, W. R., Elmwood, Conn.
Rogers & Hubbard Co., Middletown, Conn.
Shore Instrument & Mfg. Co., N. Y.

Compounds, Cleaning
Oakley Chemical Co., 24 Thames St., N. Y.
White & Bagley Co., Worcester, Mass.

Compounds, Cutting, Drawing, Drilling, Grinding and Screw Cutting
Clover Mfg. Co., Norwalk, Conn.
Fiske Bros. Refining Co., 24 State St., N. Y.
Oakley Chemical Co., 24 Thames St., N. Y.
Texas Co., 17 Battery Place, N. Y.
White & Bagley Co., Worcester, Mass.

Compound Tapping, Grinding & Polishing
Clover Mfg. Co.

Compounds, Pipe-Joint
Smooth-On Mfg., Jersey City, N. J.

Compressors, Air and Gas
Black & Decker Mfg. Co., Baltimore, Md.
Chicago Pneumatic Tool Co., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Ingersoll-Rand Co., 11 Broadway, N. Y. City.
Sullivan Machinery Co., Chicago, Ill.
Worthington Pump & Machinery Corp., N. Y.

Conduits, Interior
General Electric Co., Schenectady, N. Y.

Cones, Friction
Evans Fric. Cone Co., Newton Highlands, Mass.

Connecting-Rods and Straps
Standard Gauge Steel Co., Beaver Falls, Penn.

Connectors, Solderless
Holtzer-Cabot Electric Co., Boston.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

Contract Work
The Advance Mach. Co., Cambridge, Mass.
Alling Lander Co., Sodus, N. Y.
American Mach. & Fdy. Co., Brooklyn, N. Y.
American Standard Gauge Corp., N. Y. City.
Beaver Mach. & Tool Co., Newark, N. J.
Beaver Tool & Eng. Co., Elgin, Ill.
Becker-Milling Mach. Co., Hyde Park, Mass.
Berggren & Pearson Mach. Co., N. Y. City.
Bicknell-Thomas Co., Greenfield, Mass.
Boston Scale & Machine Co., Boston, Mass.
Browning & Co., Victor R., College Point, N. Y.
Budd & Ranney Engineering Co., Columbus, O.
Carpenter Mfg. Co., E. W., Bridgeport, Conn.
Columbus Die Tool & Mach. Co., Columbus, O.
Cowdrey Mach. Wks., C. H., Fitchburg, Mass.
Dayton Auto Products Co., Dayton, O.
Douglas, W. & B. Middletown, Conn.
Franklin Die & Tool Co., Columbus, Ohio.
Franklin Machine Co., Providence, R. I.
Garvin Mach. Co., Spring & Varick St., N. Y. C.
General Machine Wks., York, Pa.
Gifford-Wood Co., Hudson, N. Y.
Globe Machine & Stamping Co., Cleveland.
Grant Mfg. & Machine Co., Bridgeport, Conn.
Gray Mach. Tool Co., Buffalo, N. Y.
Gwynn Engineering Co., Pittsburgh, Penn.
Harris Engineering Co., H. E., Bridgeport, Conn.
Hartford Special Mchy. Co., Hartford, Conn.
Hermance Mach. Co., Williamsport, Penn.
International Arms & Fuse Co., Bloomfield, N. J.
Kell, Hock & Co., Newark, N. J.
Krasberg Engineering & Mfg. Co., Chicago, Ill.
Lincoln Machine Co., Pawtucket, R. I.
Lindstrom Die Tool & Gauge Wks., Bridgeport, Ct.
McCulloch, A. P., Mach. Co., Boston.
Marvin & Casler Co., Canastota, N. Y.
Mehl Machine Tool & Die Co., Rochelle, N. J.
Meisel Press Mfg. Co., 946 Dor. Ave., Boston.
Meyers Co., W. F., Beford, Ind.
Middletown Fire A. & S. Co., Middletown, Conn.
Modern Tool Die & Mach. Co., Columbus, Ohio.
Nautical Instrument Mfg. Co., New York City.
New Britain Machine Co., New Britain, Conn.
Newman Mfg. Co., 717 Sycamore St., Cincinnati.
Newton Machine Tools Works, Philadelphia, Pa.
Oswego Mach. Wks., Oswego, N. Y.
Pearce & Co., Frederick, 18 Roe St., N. Y. C.
Perfection Mach. Wks., Buffalo, N. Y.
Potter Tool & Mach. Wks., 79 E. 130th St., N. Y.
Price Bros., Frederick, Md.
Reynolds Mach. Mfg. Co., Massillon, O.
Root Co., C. J., Bristol, Conn.
Rowbottom Machine Co., Waterbury, Conn.
Schroeder Bros. Mfg. Co., Torrington, Conn.
Sheffield Mach. & Tool Co., Dayton, Ohio.
Shepherd Engineering Co., Williamsport, Penn.
Sloan & Chace Mfg. Co., Newark, N. J.
Southworth Machine Co., Portland, Me.
Stratton & Bragg Co., Petersburg, Va.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Taylor Machine Co., Cleveland, O.
Thorn Co., J. S., Pittsburgh, Pa.
Vokel Elec. Mach. Co., Phila., Pa.
Walsh & Allen, Inc., Long Island City, N. Y.
Weber & Scher Mfg. Co., Newark, N. J.
Western Tool & Machine Works, Chicago.
West Steel Casting Co., Cleveland, O.
Whiting & Comstock, Hartford, Conn.
Worcester Mach. Works, Worcester, Mass.

Controllers and Starters, Electric
Crocker-Wheeler Co., Ampere, N. J.
General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

Converters
General Electric Co., Schenectady, N. Y.

Conveyors and Elevators (See Elevators)

Cotter Pins
Standard Tool Co., Cleveland, Ohio.

Counterbores
Advance Tool Co., Cincinnati
Cleveland Twist Drill Co., Cleveland, Ohio.
Modern Mfg. Co., Bridgeport, Conn.
National Twist Drill & Tool Co., Detroit.
Pratt & Whitney Co., Hartford, Conn.
Slocomb Co., J. T., Providence.

Countershafts
Brown & Sharpe Mfg. Co., Providence.
Diamond Machine Co., Providence.
Evans Fric. Cone Co., Newton Highlands, Mass.
Garvin Mach. Co., Spring & Varick Sts., N. Y. C.
Norton Grinding Co., Worcester, Mass.

Countersinks
Brewster Co., Wm., 30 Church St., N. Y. City.
Clark Equipment Co., Buchanan, Mich.
Gale-Sawyer Co., 33 Wormwood St., Boston.
Greenfield Tap & Die Corp., Greenfield, Mass.

Couplings, Flexible
Smith-Serrell, 138 Cedar St., N. Y. City.

Counters, Revolution
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Philadelphia.
Durant Mfg. Co., Milwaukee, Wis.
Veeder Mfg. Co., Hartford, Conn.

Counting Machines
Durant Mfg. Co., Milwaukee, Wis.
Veeder Mfg. Co., Hartford, Conn.

Couplings, Flexible
Smith-Serrell, 138 Cedar St., N. Y. City.

Counting and Printing Wheels
Doehler Die Casting Co., Brooklyn, N. Y.

Couplings, Shaft
Almond Mfg. Co., T. R., Ashburnham, Mass.
Carnegie Steel Co., Pittsburgh, Penn.
Dexter Co., I. H., 27 Walker St., N. Y. C.
Johnson Machine Co., Carlyle, Manchester, Conn.
Nicholson & Co., W. H., Wilkes-Barre, Penn.
Smith-Serrell Co., Inc., 138 Cedar St., N. Y. C.
Standard Gauge Steel Co., Beaver Falls, Penn.

Cranes, Electric
Toledo Bridge & Crane Co., Toledo, O.

Cranes, Hand (See Hoists)

Cranes, Locomotive
Link-Belt Co., Chicago, Philadelphia.
Yale & Towne Mfg. Co., 9 E. 40th St., N. Y. C.

Cranes, Traveling
Case Crane & Engineering Co., Columbus, Ohio.
Chisholm-Moore Mfg. Co., Cleveland, Ohio.
Harrington, Son & Co., Edwin, Philadelphia, Pa.
Niles-Bement-Pont Co., 111 Broadway, N. Y. C.
Northern Engineering Wks., Detroit, Mich.
Pawling & Harnischfeger Co., Milwaukee, Wis.
Shepard Electric C. & H. Co., Montour, Falls, N. Y.
Whiting Foundry Equipment Co., Harvey, Ill.
Wright Mfg. Co., Lisbon, Ohio.
Yale & Towne Mfg. Co., 9 E. 40th St., N. Y. C.

Crank Pin Turning Machines
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.
Underwood & Co., H. B., Philadelphia, Penn.

Crucibles
Dixon Crucible Co., Joseph, Jersey City, N. J.

Cupolas and Ladles
Paxson Co., J. W., Philadelphia, Penn.
Whiting Foundry Equipment Co., Harvey, Ill.

Cutters, Flue
Clark Equipment Co., Buchanan, Mich.

Cutters, Gear
Barber-Colman Co., Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Milling Mach. Co., Cleveland, Ohio.
Goddard Tool Co., Chicago, Ill.
National Twist Drill & Tool Co., Detroit.
Standard Tool Co., Cleveland, Ohio.
Union Twist Drill Co., Athol, Mass.

Cutters, Milling
Advance Tool Co., Cincinnati, Ohio.

THE HEIGHT
BAY STATE
BAY STATE TAP & DIE CO. MANSFIELD. MASS

Beacon Tool & Supply Co., N. Y. City.
Becker Milling Machine Co., Hyde Park, Mass.
Bilton Machine Tool Co., Bridgeport, Conn.
Brewster Co., Wm., 30 Church St., N. Y. City.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Milling Machine Co., Cleveland, Ohio.
Cowles Tool Co., Cleveland, Ohio.
Gale-Sawyer Co., 33 Wormwood St., Boston.
Geometric Tool Co., New Haven, Conn.
Goddard & Goddard Co., Detroit, Mich.
Goddard Tool Co., Chicago, Ill.
Ingersoll Milling Mach. Co., Rockford, Ill.
Krasberg Eng. & Mfg. Co., Chicago, Ill.
Lincoln Twist Drill Co., The, Taunton, Mass.
Modern Mfg. Co., Bridgeport, Conn.
National Tool Co., Cleveland, Ohio.
National Twist Drill & Tool Co., Detroit.
Pratt & Whitney Co., Hartford, Conn.
Reliance Steel & Tool Co., N. Y. City.
Standard Tool Co., Cleveland, Ohio.
Thurston Mfg. Co., Providence, R. I.
Union Twist Drill Co., Athol, Mass.
Whitney Mfg. Co., Hartford, Conn.
Worcester Mach. Wks., Worcester, Mass.

Cutters, Thread
Rivett Lathe & Grinder Co., Brighton, Boston.

Cutting-Off Machines
Armstrong-Blum Mfg. Co., Chicago, Ill.
Armstrong Bros. Tool Co., Chicago, Ill.
Atkins & Co., C. E., Indianapolis, Ind.
Automatic Machine Co., Bridgeport, Conn.
Brown Instrument Co., Philadelphia, Penn.
Coats Machine Tool Co., 30 Church St., N. Y. C.
Cochrane-Bly Co., Rochester, N. Y.
Earle Gear & Machine Co., Philadelphia, Penn.
Etna Machine Co., Toledo, Ohio.
Garvin Mach. Co., Spring & Varick St., N. Y. C.
Gorton Mach. Co., Geo., Racine, Wis.
Greenfield Tap & Die Corp., Machy. Division, Greenfield, Mass.
Hurlbut, Rogers Mchy. Co., South Sudbury, Mass.
Newton Mach. Tool Works, Philadelphia, Penn.
Peter Bros. Mfg. Co., Algonquin, Ill.
Racine Tool & Mach. Co., Racine, Wis.
Vandyck Churchill Co., 93 Liberty St., N. Y. C.

Cutting-Off Machines, Pipe (See Pipe-Cutting and Threading Machines)

Cutting-Off Tools
Armstrong Bros. Tool Co., Chicago, Ill.
Pratt & Whitney Co., Hartford, Conn.
Union Tool Co., Orange, Mass.
Western Tool & Mfg. Co., Springfield, Ohio.

Cutting Oil Filters (See Oil Filtering Systems)

Cutting, Oxy-Acetylene
Davis-Bournonville Co., Jersey City, N. J.
International Oxygen Co., 115 Bway, N. Y. City.
Oxweld Acetylene Co., Chicago, Ill.

Cut-Outs, Electrical
D & W Fuse Co., Providence, R. I.
General Electric Co., Schenectady, N. Y.
Holtzer-Cabot Electric Co., Boston.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

Dealers, Machinery (See Searchlight Section)
American Mchy. Exchange, New York City.
Baird Machinery Co., W. J., Detroit, Mich.
Beal & Co., Jos., 453 Atlantic Ave., Boston.
Bennett Mchy. Co., G. L., 30 Church St., N. Y. C.
Brownell Machry. Co., Providence, R. I.
Carpenter & Woodward, N. Y. City.
Clifton-Pratt Co., Cincinnati.
Day Mchy. Co., 651 Ellicott Sq., Buffalo, N. Y.
Eagle Machinery Co., N. Y. City.
Factory & Mill Supply Co., Boston, Mass.
Federal Machinery Sales Co., Chicago, Ill.
Fitzgerald & Co., W. H. J., 30 Oliver St., Boston.
Flour City O. Iron Co., Minneapolis, Minn.
Foss Mchy. & Supply Co., Geo. F., N. Y. City.
Garvin Mach. Co., Spring & Varick St., N. Y. C.
Gelb & Co., J., 201 Center St., N. Y.
General Railway Signal Co., Rochester, N. Y.
Graves Mchy. Exchange, 50 Church St., N. Y. C.
Harris Bros. Co., 35th and Iron St., Chicago, Ill.
Hill, Clarke & Co., of Chicago, Chicago, Ill.
Hill, Clark & Co., 156 Oliver St., Boston, Mass.
Industrial Mchy. Corp., Jersey City, N. J.
Inter-Continental Mchy. Corp., N. Y. City.
Kinsey Co., E. A., Cincinnati, Ohio.
Klein & Co., Nathan, N. Y. City.
Lamberg & Co., A., 241 Centre St., N. Y. C.
Lynd-Farquhar Co., 419 Atlantic Ave., Boston.
McCoy-Brandt Machinery Co., Pittsburgh.
McDonough Mfg. Co., Eau Claire, Wis.
McMullen Mchy. Co., Grand Rapids Mich.
Machineshop Equipment Corp., Boston.
Marshall & Huschart Mchry. Co., Chicago, Ill.
Mechanical Eng. Co., Three Rivers, Can.
Modern Mchy. Exch., 52 Walker St., N. Y. City.
Morris Mchy Co., 93 Chestnut St., Newark, N. J.
National Products Co., E. Liverpool, Ohio.
New Jersey Mchy. Exchange, Newark, N. J.
New York Mchy. Exch., 50 Church St., N. Y. C.
Niles, Inc., F. H., N. Y. City.
Osborne & Sexton Mchy. Co., Columbus, Ohio.
Parmele, Chas. L., 50 Church St., N. Y. City.
Prentiss & Co., Henry, Singer Bldg., N. Y. City.
Riverside Mchy. Depot, Detroit, Mich.
Seifreat-Woodruff Co., Cincinnati, Ohio.
Simmons Mach. Co., 149 Broadway, N. Y. City.
Spicer Mfg. Co., Plainfield, N. J.
Stickley Mach. Co., E. B., Goebel Bldg., Detroit.
Stocker, Rumely, Wachs Co., Chicago.
Strong, Carlisle & Hammond Co., Cleveland, O.
Toomey, Frank, 127 N. 3rd St., Phila., Penn.
Vandyck, Churchill Co., 93 Liberty St., N. Y. C.
Vonnegut Mchy. Co., Indianapolis, Ind.
Walsh Mchy. Co., M. J., Milwaukee, Wis.
Wayne Mchy Co., Fort Wayne, Ind.
Weeks Mach. Tool Co., D., N. Y. City
Westinghouse Elec. & Mfg. Co., Pittsburgh, Pa.
Wickes Mchy. Co., Jersey City, N. J.
Winterer, Herman L., Philadelphia.
Young, Corley & Dolan, 115 Bway, N. Y. City.
Zelnicker Sup. Co., Walter A., St. Louis, Mo.

Diamond Tools
Crafts & Co., Arthur A., 125 Summer St., Boston.
Desmond-Stephen Mfg. Co., Urbana, Ohio.
Dickinson, Thomas L., 64 Nassau St., N. Y. City.
Francis & Co., 50 State St., Hartford, Conn.
Wheel Truing Tool Co., 320 Ford Bldg., Detroit.

Die Making Machines
Anderson Die Mach. Co., Bridgeport, Conn.
Cochrane-Bly Co., Rochester, N. Y.
Keller Mech. Engg. Co., Brooklyn, N. Y.
Thurston Mfg. Co., Providence, R. I.

Die Sinking Machines, Automatic
Jackson Machine Tool Co., Jackson, Mich.
Keller Mech. Eng. Co., Brooklyn, N. Y.
Dies, Sheet Metal and Sub-Press (See Tool Work)

Die, Threading-Opening
Eastern Mach. Screw Corp., New Haven, Conn.
Errington, F. A., 41 Cortlandt St., N. Y. City.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Greenfield, Mass
Ideal Tool & Mfg. Co., Beaver Falls, Pa.
Jones & Lamson Mach Co., Springfield, Vt.
Landis Mach. Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Mch. & Tool Co., 64 Porter St., Detroit.
National Acme Co., Cleveland, Ohio.
National Mchy. Co., Tiffin, Ohio.
Warner & Swasey Co., Cleveland, Ohio.
Webster & Perks Tool Co., Springfield, Ohio.

Dogs, Lathe and Milling Machine
Armstrong Bros. Tool Co., Chicago, Ill.
Page-Storms Drop Forge Co., Chicopee, Mass.
Union Tool Co., Orange, Mass.
William & Co., J. H., Brooklyn, N. Y.

Drafting Boards
Swedish Gage Co., 245 W. 55 St., N. Y. City.

Dressers, Grinding Wheel
Baldwin, Tuthill & Bolton, Grand Rapids, Mich.
Crafts & Co., Arthur A., 125 Summer St., Boston
Desmond-Stephan Mfg. Co., Urbana, Ohio.
Francis & Co., 50 State St., Hartford, Conn.
Norton Co., Worcester, Mass.
Standard Tool Co., Cleveland, Ohio.

Drill Holders
Armstrong Bros. Tool Co., Chicago, Ill.
Union Tool Co., Orange, Mass.

Drill Rods
Boker & Co., H., 101 Duane St., N. Y. City.

Drill Speeders
Graham Mfg. Co., Providence, R. I.
Turner Machine Co., Danbury, Conn.

Drilling Machines, Automatic
Baker Bros., Toledo, Ohio.
Bilton Mach. Tool Co., Bridgeport, Conn.
Cincinnati Pulley Machinery Co., Cincinnati, O.
National Automatic Tool Co., Richmond, Ind.

Drilling Machines, Bench
Ames Co., B. C., Waltham, Mass.
Barnes Co., W. F. & John, Rockford, Ill
Bilton Mach. Tool Co., Bridgeport, Conn.
Cincinnati Pulley Mchy. Co., Cincinnati, Ohio.
Clark Electric Co., Jas., Jr., Louisville, Ky.
Hoefer Mfg. Co., Freeport, Ill.
Landau Machine & Drill Press Co., N. Y. City.
Pratt & Whitney Co., Hartford, Conn.
Rockford Drilling Mach. Co., Rockford, Ill.
Sigourney Tool Co., Hartford, Conn.
Silver Mfg. Co., Salem, Ohio.
Sloan & Chace Mfg. Co., Newark, N. J.
Standard Elec. Tool Co., Cincinnati, O.
Taylor & Fenn Co., Hartford, Conn.
U. S. Electrical Tool Co., Cincinnati, Ohio.

Drilling Machines, Electric and Hand
Black & Decker Mfg. Co., Baltimore, Md.
Chicago Pneumatic Tool Co., Chicago, Ill.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Clark Electric Co., Jas., Jr., Louisville, Ky.
Independent Pneumatic Tool Co., Chicago, Ill.
Ingersoll-Rand Co., 11 Broadway, N. Y. City.
Neil & Smith Electric Tool Co., Cincinnati, Ohio.
Silver Mfg. Co., Salem, Ohio.
U. S. Electrical Tool Co., Cincinnati, Ohio.
Wisconsin Electric Co., Racine, Wis.

Drilling Machines, Gang
Baker Bros., Toledo, Ohio.
Barnes Drill Co., 830 Chestnut St., Rockford, Ill.
Bilton Mach. Tool Co., Bridgeport, Conn.
Cincinnati Bickford Tool Co., Cincinnati, Ohio.
Colburn Mach. Tool Co., Franklin, Pa.
Moline Tool Co., Moline, Ill.
Silver Mfg. Co., Salem, Ohio.
Sipp Mach. Co., Erie R. R. Ave., Paterson, N. J.
Taylor & Fenn Co., Hartford, Conn.

Drilling Machine Heads
Hoefer Mfg. Co., Freeport, Ill.
Nelson-Blanck Mfg. Co., Detroit, Mich.
Newman Mfg. Co., 717 Sycamore St., Cincinnati,
Sr-afford Tool Works, Hartford, Conn.
Standard Elec. Tool Co., Cincinnati, O.

Drilling Machines, Heavy Duty
Baker Bros., Toledo, Ohio.
Betts Mach. Co., Rochester, N. Y.
Colburn Mach. Tool Co., Franklin, Pa.
Hoefer Mfg. Co., Freeport, Ill.
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.

Drilling Machines, Horizontal (See Boring, Drilling and Milling Machines, Horizontal)

Drilling Machines, Multiple Spindle
Cincinnati Pulley Mchy. Co., Cincinnati, Ohio.
Fox Mach. Co., Jackson, Mich.
Harrington, Son & Co., Edwin, Philadelphia, Pa.
Hoefer Mfg. Co., Freeport, Ill.
Landau Machine & Drill Press Co., N. Y. City.
Leland-Gifford Co., Worcester, Mass.
Moline Tool Co., Moline, Ill.
National Acme Co., Cleveland, Ohio.
Mueller Mach. Tool Co., Cincinnati, Ohio.
National Automatic Tool Co., Richmond, Ind.
Newton Mach. Tool Works, Philadelphia, Penn.
Rockford Drilling Mach. Co., Rockford, Ill.
Sellers & Co., Wm., Philadelphia, Pa.
Sigourney Tool Co., Hartford, Conn.
Taylor & Fenn Co., Hartford, Conn.
Turner Machine Co., Danbury, Conn.

Drilling Machines, Pneumatic
Cleveland Pneumatic Tool Co., Cleveland, Ohio.
Independent Pneumatic Tool Co., Chicago, Ill.
Ingersoll-Rand Co., 11 Broadway, N. Y. City.

Drilling Machines, Portable
Newton Mach. Tool Works, Philadelphia, Penn.
Stow Mfg. Co., Binghamton, N. Y.
U S. Electrical Tool Co., Cincinnati, Ohio.
Wisconsin Electric Co., Racine, Wis.

Drilling Machines, Radial
American Tool Works Co., Cincinnati, Ohio.
Betts Machine Co., Rochester, N. Y.
Canedy-Otto Mfg. Co., Chicago Heights, Ill.
Carlton Mach. Tool Co., Cincinnati, Ohio.
Cincinnati Bickford Tool Co., Cincinnati, Ohio.
Dreses Mach. Tool Co., Cincinnati, Ohio.
Fosdick Mach. Tool Co., Cincinnati, Ohio.
Hammond Mfg. Co., Cleveland, Ohio.
Harrington, Son & Co., Edwin, Philadelphia, Pa.
Lynd-Farquhar Co., Boston, Mass.
Morris Mach. Tool Co., Cincinnati, Ohio.
Mueller Mach. Tool Co., Cincinnati, Ohio.
Niles-Bement-Pond Co., 11 Broadway, N. Y. City.
Reed-Prentice Co., Worcester, Mass.
Sellers & Co., Wm., Philadelphia, Pa.
Stow Mfg. Co., Binghamton, N. Y.
Strong, Carlisle & Hammond Co., Cleveland, O.
Taylor & Fenn Co., Hartford, Conn.

Drilling Machines, Sensitive
Bilton Mach. Tool Co., Bridgeport, Conn.
Cincinnati Pulley Machy. Co., Cincinnati, Ohio.
Edlund Machry. Co., Inc., Cortland, N. Y.
Henry & Wright Mfg. Co., Hartford, Conn.
Knight Machy. Co., W. B., St. Louis, Mo.
Leland-Gifford Co., Worcester, Mass.
Reed-Prentice Co., Worcester, Mass.
Royersford Fdry. & Mach. Co., Royersford, Penn.
Sigourney Tool Co., Hartford, Conn.
Sipp Mach. Co., Erie R. R. Ave., Paterson, N. J
Taylor & Fenn Co., Hartford, Conn.
Wisconsin Electric Co., Racine, Wis.

Drilling Machines, Turret
National Automatic Tool Co., Richmond, Ind.
Turner Machine Co., Danbury, Conn.

Drilling Machines, Vertical
Baker Bros., Toledo, Ohio.
Barnes Co., W. F. & John, Rockford, Ill.
Barnes Drill Co., Inc., Rockford, Ill.
Betts Machine Co., Rochester, N. Y.
Cincinnati Bickford Tool Co., Cincinnati, Ohio.
Cincinnati Pulley Machy. Co., Cincinnati, Ohio.
Colburn Mach. Tool Co., Franklin, Pa.
Harrington, Son & Co., Edwin, Philadelpiha, Pa.
Hoefer Mfg. Co., Freeport, Ill.
Knight Machy. Co., W. B., St. Louis, Mo.
Landau Machine & Drill Press Co., N. Y. City.
Leland-Gifford Co., Worcester, Mass.
Niles-Bement-Pond Co., 111 Bway, N. Y. City.
Reed-Prentice Co., Worcester, Mass.
Rockford Drilling Mach. Co., Rockford, Ill.
Royersford Fdry. & Mach. Co., Royersford, Pa.
Sigourney Tool Co., Hartford, Conn.
Silver Mfg. Co., Salem, Ohio.
Stow Mfg. Co., Binghamton, N. Y.
Taylor & Fenn Co., Hartford, Conn.
Turner Machine Co., Danbury, Conn.

Drills, Center
Cleveland Twist Drill Co., Cleveland, Ohio.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Detroit, Mich.
Pratt & Whitney Co., Hartford, Conn.
Reliance Steel & Tool Co., 24 Murray St., N. Y.
Slocomb Co., J. T., Providence, R. I.
Standard Tool Co., Cleveland, Ohio.
Union Twist Drill Co., Athol, Mass.

Drills, High Speed
Beacon Tool & Supply Co., N. Y. City.
Brewster Co., Wm., 30 Church St., N. Y. City.
Lincoln Twist Drill Co., The, Taunton, Mass.

Drills, Ratchet
Armstrong Bros. Tool Co., Chicago, Ill.
Cleveland Twist Drill Co., Cleveland, Ohio.
National Twist Drill Co., Detroit.
Reliance Steel & Tool Co., 24 Murray St., N. Y.
Union Twist Drill Co., Athol, Mass.

Drills, Track
Clark Equipment Co., Buchanan, Mich.

Drills, Twist and Flat
Beacon Tool & Supply Co., N. Y. City.
Brewster Co., Wm., 30 Church St., N. Y. City.
Buckeye Twist Drill Co., Alliance, Ohio.
Clark Equipment Co., Buchanan, Mich.
Cleveland Twist Drill Co., Cleveland, Ohio.
Colton Co., Arthur, Detroit, Mich.
Hammacher, Schlemmer & Co., N. Y. City.
Lincoln Twist Drill Co., The, Taunton, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Detroit.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland, Ohio.
Union Twist Drill Co., Athol, Mass.

Drying Apparatus
American Blower Co., Detroit, Mich.

Dust Handling Equipment
Pangborn Corporation, Hagerstown, Md.

Dynamometers
General Electric Co., Schenectady, N. Y.
Holtzer-Cabot Electric Co., Boston.
Sprague Electric Works, 527 W. 34th St., N. Y.C.

Electrical Instruments
Brown Instrument Co., Philadelphia, Pa.
General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

Electrical Supplies
D & W Fuse Co., Providence, R. I.
General Electric Co., Schenectady, N. Y.
Holtzer-Cabot Electric Co., Boston.
Sprague Electric Works, 527 W. 34th St., N. Y.C.
Johns-Manville Co., H. W., N. Y. City.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

Elevating Trucks (See Trucks)

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American mechanical genius gives of its best. And among all the American products that enter into the making of these distinctly American machines, NICHOLSON FILES have a prominent place.

The Name NICHOLSON means, to builders of Aeroplanes, files valued for speedy cutting powers and extra service-giving QUALITY. Their skilled workers demand the files that they have known in times of peace. A file for every purpose.

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Elevators and Conveyors
Albro-Clem Elevator Co., Philadelphia, Pa.
Link-Belt Co., Chicago, Philadelphia.
Pangborn Corporation, Hagerstown, Md.

Emery Wheels (See Grinding Wheels)

Enamels, Machinery
Felton, Sibley & Co., Inc., Philadelphia, Pa.
Hilo Varnish Corp., 8 Gerry St., Bklyn., N. Y.

Engineers, Lubrication
Bowser & Co., S. F., Fort Wayne, Ind.

Engineers, Mechanical
The Advance Mach. Co., Cambridge, Mass.
Harris Engineering Co., H. E., Bridgeport, Conn.
Hartford Special Machy. Co., Hartford, Conn.
Krasberg Eng. & Mfg. Co., Chicago, Ill.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

Engraving Machinery
Gorton Mach. Co., Geo., Racine, Wis.
Keller Mech. Eng. Co., Co., Brooklyn, N. Y.

Expanders, Tube
Dudgeon, Richard, New York City.
Watson-Stillman Co., 42 Church St., N. Y. City.

Eyeglass, Safety (See Goggles, Safety)

Eye Protectors
Willson & Co., T. A., Reading, Pa.

Fans, Electric
Crocker-Wheeler Co., Ampere, N. J.
General Electric Co., Schenectady, N. Y.
Sprague Electric Works, 527 W. 34th St., N. Y.C
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

Fans, Exhaust
American Blower Co., Detroit, Mich.
General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

Fans, Ventilating
General Electric Co., Schenectady, N. Y.
Mechanical Appliance Co., Milwaukee, Wis.

Fibre, Vulcanized
Diamond State Fibre Co., Bridgeport, Pa.

File Handles
Grover File Co., Nashua, N. H.
Nicholson File Co., Providence, R. I.
Western Tool & Mfg. Co., Springfield, Ohio.

Files and Rasps
Barnett Co., G. & H., Philadelphia, Pa.
Delta File Works, Philadelphia, Pa.
Grover File Co., Nashua, N. H.
Hammacher, Schlemmer & Co., N. Y. City.
Nicholson File Co., Providence, R. I.
Simonds Mfg. Co., Fitchburg, Mass.

Filing Machines
Ames Co., B. C., Waltham, Mass.
Anderson Die Mach. Co., Bridgeport, Conn.
Cochrane-Ely Co., Rochester, N. Y.
Colton Co., Arthur, Detroit, Mich.
Noble & Westbrook Mfg. Co., Hartford, Conn.
Thurston Mfg. Co., Providence, R. I.

Filler, Iron (See Cement, Iron)

Fittings, Hydraulic
Elmes Engineering Works, Chas. F., Chicago, Ill.
Watson-Stillman Co., 42 Church St., N. Y. City.

Flexible Shafts
Chicago Flexible Shaft Co., Chicago, Ill
Errington, F. A., 41 Cortland St., N. Y. City.
Gem Mfg. Co., Pittsburgh, Pa.
Stow Mfg. Co., Binghamton, N. Y.

Forging Dies
Keller Mech. Eng. Co., Brooklyn, N. Y.

Forging Machinery
Acme Machinery Co., Cleveland, Ohio.
Billings & Spencer Co., Hartford, Conn.
Bradley & Son, C. C., Syracuse, N. Y.
National Machy. Co., Tiffin, Ohio.

Forgings, Drop
Bearings Co. of America, Lancaster, Pa.
Billings & Spencer Co., Hartford, Conn.
Moore Drop Forging Co., Springfield, Mass.
Page-Storms Drop Forge Co., Chicopee, Mass.
Steel Improvement & Forge Co., Cleveland.
Williams & Co., J. H., Brooklyn, N. Y.

Forgings, Hammer
Aborn Steel Co., Inc., 22 Clarke St., N. Y. City.
Halcomb Steel Co., Syracuse, N. Y. City.
Hobson, Honghton & Co., Ltd., N. Y. City.
Page-Storms Drop Forge Co., Chicopee, Mass.
Williams & Co., J. H., Brooklyn, N. Y.

Foundry Equipment
Atkins & Co., C. E., Indianapolis, Ind.
Whiting Foundry Equipment Co., Harvey, Ill.

Foundry Supplies
Dixon Crucible Co., Joseph, Jersey City, N. J.
Paxson Co., J. W., Philadelphia, Pa.
Whitman & Barnes Mfg. Co., Akron, Ohio.

Furnaces, Heat-Treating Coal
American Incandescent Heat Co., Boston, Mass.

Furnaces, Heat-Treating Oil and Gas
American Gas Furnace Co., 24 John St., N. Y. C.
American Incandescent Heat Co., Boston, Mass.
Bellevue Industrial Furnace Co., Detroit.
Bennett, W. R., Elmwood, Conn.
Brown & Sharpe Mfg. Co., Providence, R. I.
Chicago Flexible Shaft Co., Chicago, Ill.
Gilbert & Barker Mfg. Co., Springfield, Mass.
Hermansen, A., Woolworth Bldg., N. Y.
Johnson Gas Appliance Co., Cedar Rapids, Iowa.
Standard Fuel Engineering Co., Detroit, Mich.
Strong, Carlisle & Hammond Co., Cleveland, O.

Furnaces and Ovens, Electric
Brown Instrument Co., Philadelphia, Pa.
Englehard, Charles, 30 Church St., N. Y. City.
General Electric Co., Schenectady, N. Y.

Furnaces, Tempering and Annealing
Bennett, W. R., Elmwood, Conn.
Chicago Flexible Shaft Co., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Gilbert & Barker Mfg. Co., Springfield, Mass.
Hermanson, A., Woolworth Bldg., N. Y. City.
Johnson Gas Appliance Co., Cedar Rapids, Iowa.
Standard Fuel Engineering Co., Detroit, Mich.
Strong, Carlisle & Hammond Co., Cleveland, O.

Furniture, Machine Shop
Manufacturing Equipment & Engineering Co., Framington, Mass.
New Britain Mach. Co., New Britain, Conn.
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.

Fuses, Electric
Johns-Manville Co., H. W., N. Y. City.

Gages, Dial
Ames Co., B. C., Waltham, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Randall & Stickney, Waltham, Mass.
Starrett Co., L. S., Athol, Mass.

Gages, Indicating
Grove Mfg. Co., Dayton, Ohio.

Gages, Snap, Thread and Cylindrical
Greenfield Tap and Die Corp., Greenfield, Mass.
Swedish Gage Co., 245 W. 55 St., N. Y. City.

Gages, Recording
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Philadelphia, Pa.
General Electric Co., Schenectady, N. Y.

Gages, Special Measuring (See Tool Work)

Gages, Standard
Advance Tool Co., Cincinnati, Ohio.
Bicknell-Thomas Co., Greenfield, Mass.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hartford Special Machy. Co., Hartford, Conn.
Swedish Gage Co., 245 W. 55th St., N. Y. City.

Gages, Thread
Greenfield Tap & Die Corp., Greenfield, Mass.
Modern Mfg Co., Bridgeport, Conn.
Pratt & Whitney Co., Hartford, Conn.
Sheffield Mach. & Tool Co., Dayton, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

Gas, Compressed
Davis-Bournonville Co., Jersey City, N. J.
International Oxygen Co., 115 Broadway, N. Y. C.
Oxweld Acetylene Co., Chicago, Ill.

Gaskets
Diamond State Fibre Co., Bridgeport, Pa.
Graton & Knight Mfg. Co., Worcester, Mass.

Gear Blanks
Carnegie Steel Co., Pittsburgh, Pa.

Gear Cutting Machines
Adams Co., 1902 Bridge St., Dubuque, Iowa.
Barber-Colman Co., Rockford, Ill.
Becker Milling Mach. Co., Hyde Park, Mass.
Bilgram Mach. Works, Philadelphia, Pa.
Bilton Mach. Tool Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Gear Cutting Mach. Co., Cincinnati.
Clough, R. M., Meriden, Conn.
Fellows Gear Shaper Co., Springfield, Vt.
Flather Mfg. Co., Nashua, N. H.
Garvin Mach. Co., Spring and Varick St., N. Y. C.
Gleason Works, Rochester, N. Y.
Gould & Eberhardt, Rochester, N. Y.
Harrington, Son & Co., Edwin, Philadelphia, Pa.
Lees-Bradner Co., Cleveland, Ohio.
Newark Gear Cutting Mach. Co., Newark, N. J.
Newton Mach. Tool Works, Philadelphia, Pa.
Prentiss & Co., Henry, Singer Bldg., N. Y. City.
Sloan & Chace Mfg. Co., Newark, N. J.
Strong, Carlisle & Hammond Co., Cleveland, O.
Waltham Mach. Works, Waltham, Mass.
Whiton Mach. Co., D. E., New London, Conn.

Gear Tempering Machinery
Gleason Works, Rochester, N. Y.

Gear Testing Machinery
Adams Co., 1902 Bridge St., Dubuque, Iowa.
Brown & Sharpe Mfg. Co., Providence, R. I.
Gisholt Machine Co., Madison, Wis.
Gleason Works, Rochester, N. Y.

Gear Tooth Rounding Machines
Ingle Machine Co., Rochester, N. Y

Gears, Cast
Brown & Sharpe Mfg. Co., Providence, R. I.
Brown Co., A. & F., 79 Barclay St., N. Y. City.
Cleveland Worm & Gear Co., Cleveland, Ohio.
Grant Gear Works, 151 Pearl St., Boston, Mass
Horsburgh & Scott Co., Cleveland, Ohio.
Link-Belt Co., Chicago, Philadelphia.
Meisel Press Mfg. Co., Boston, Mass.
Philadelphia Gear Works, Philadelphia, Pa.

Gears, Cut
Adams Co., 1902 Bridge St., Dubuque, Iowa.
Albaugh-Dover Co., Chicago, Ill.
Albro-Clem Elevator Co., Philadelphia, Pa.
Bilgram Mach. Works, Philadelphia, Pa.
Boston Gear Wks., Norfolk Downs, Quincy, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Brown Co., A. & F., 79 Barclay St., N. Y. City.
Chicago Rawhide Mfg. Co., Chicago, Ill.
Cincinnati Gear Co., Cincinnati, Ohio.
Cleveland Worm & Gear Co., Cleveland, Ohio.
Crofoot Gear Wks., Sta. "A," Cambridge, Mass.
Diamond State Fibre Co., Bridgeport, Pa.
Earle Gear & Machine Co., Philadelphia, Pa.
Fawcus Machine Co., Pittsburgh, Pa.
Fellows Gear Shaper Co., Springfield, Vt.
Flather Mfg. Co., Nashua, N. H.
Foote Bros. Gear & Mach. Co., Chicago, Ill.
Garvin Mach. Co., Spring & Varick St., N. Y. C.
General Electric Co., Schenectady, N. Y.
Gleason Works, Rochester, N. Y.
Gould & Eberhardt., Newark, N. J.
Grant Gear Works, Inc., 151 Pearl St. Boston.
Horsburgh & Scott Co., Cleveland, Ohio.
Langelier Mfg. Co., Arlington, Cranston, R. I.
M-C Mfg. Co., 28 Congress St., Newark, N. J.
Maag Gear Co., Yonkers, N. Y.
Meisel Press Mfg. Co., Boston, Mass.
Newark Gear Cutting Mach. Co., Newark, N. J.
New Britain Mach. Co., New Britain, Conn.
New Process Gear Corp., Syracuse, N. Y.
Nuttall Co., R. D., Pittsburgh, Pa.
Philadelphia Gear Works, Philadelphia, Pa.
Pittsburgh Gear & Mach. Co., Pittsburgh, Pa.
Simonds Mfg. Co., Fitchburg, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Taylor Mach. Co., Cleveland, O.

Gears, Herringbone
Boston Gear Wks., Norfolk Downs, Quincy, Mass.
Fawcus Machine Co., Pittsburgh, Pa.
Meisel Press Mfg. Co., 346 Dar. Ave., Boston.

Gears, Rawhide (See Gears, Cut)

Generators, Electric
Crocker-Wheeler Co., Ampere, N. J.
General Electric Co., Schenectady, N. Y.
Reliance Electric & Engineering Co., Cleveland.
Sprague Electric Works, 527 W. 34th St., N. Y.C.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

Generators, Electric
Holtzer-Cabot Electric Co., Boston.

Generators, Gas
International Oxygen Co., 115 Bway, N. Y. City.

Glue Pots, Electric
American Elec. Heater Co., Detroit, Mich.

Goggles, Safety
Willson & Co., T. A., Reading, Penn.

Grab Buckets
Link-Belt Co., Chicago, Philadelphia.

Graphite
Dixon Crucible Co., Joseph, Jersey City, N. J.
Felton, Sibley & Co., Inc., Philadelphia, Pa.

Gray-Iron Castings
Gifford-Wood Co., Hudson, N. Y.

Greases, Lubricating
Fiske Bros. Refining Co., 24 State St., N. Y. C.
White & Bagley Co., Worcester, Mass.
Texas Co..17 BBattery Place, N. Y.

Grinding Floor and Tool
Detroit Tool Co., Detroit, Mich.

Grinding Machines, Abrasive Belt
Blevney Machine Co., Greenfield, Mass.

Grinding Machines, Ball Bearing Race (See Grinding Machines, Radial)

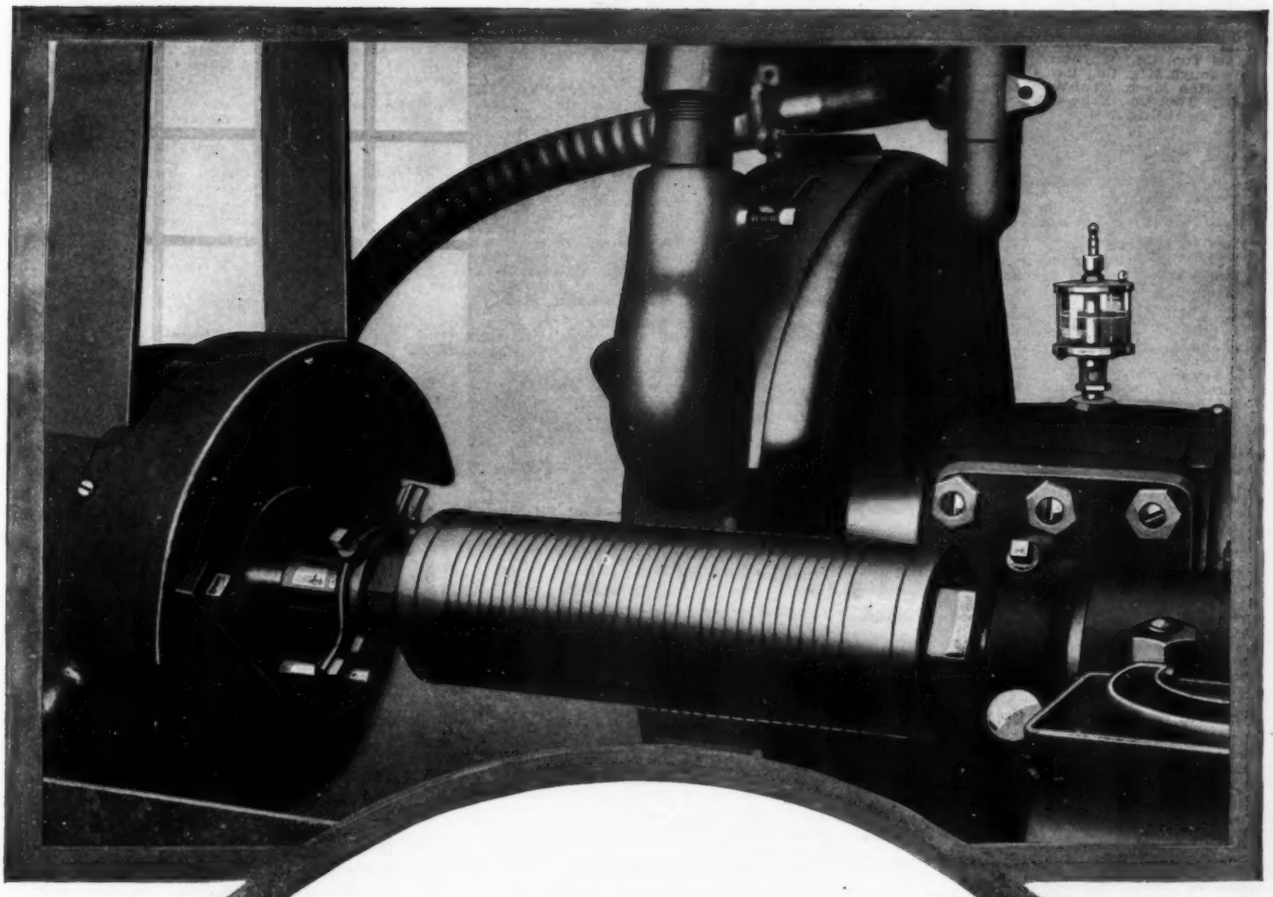
Grinding Machines, Bench
Athol Machine Co., Athol, Mass.
Blount Co., J. G., Woodland St., Everett, Mass.
Clark Electric Co., Jas., Jr., Louisville, Ky.
Diamond Machine Co., Providence, R. I.
Forbes & Myers, 170 Union St., Worcester, Mass.
Gale-Sawyer Co., 33 Wormwood St., Boston.
Greenfield Tap & Die Corp., Machy. Division, Greenfield, Mass.
Marschke Mfg. Co., Indianapolis, Ind.
Norton Co., Worcester, Mass.
Patch & Sons Co., S. B., Streator, Ill.
Ransom Mfg. Co. Oshkosh, Wis.
Safety Emery Wheel Co., Springfield, Ohio.
Standard Elec. Tool Co., Cincinnati, O.
Union Twist Drill Co., Athol, Mass.
U. S. Elec. Tool Co., Cincinnati, Ohio.
Walker Co., O. S., Worcester, Mass.
Webster & Perks Tool Co., Springfield, Ohio.

Grinding Machines, Center
Cincinnati Elec. Tool Co., Cincinnati, Ohio.
Gem Mfg. Co., Pittsburgh, Pa.
Standard Elec. Tool Co., Cincinnati, O.
Stow Mfg. Co., Binghamton, N. Y.
Wilmarth & Morman Co., Grand Rapids, Mich.

Grinding Machines, Chucking
Blanchard Machine Co., Cambridge, Mass.
Bryant Chucking Grinder Co., Springfield, Vt.
Heald Machine Co., Worcester, Mass.
Pratt & Whitney Co., Hartford, Conn.
Rivett Lathe & Grinder Co., Brighton, Boston.
Van Norman Mach. Tool Co., Springfield, Mass.

Grinding Machines, Cutter and Reamer
Armstrong Bros. Tool Co., Chicago, Ill.
Barnes, Wm. O., Leominster, Mass.
Barnes Co., W. F. & John, Rockford, Ill.
Blake & Johnson Co., Waterbury, Conn.
Blount Co., J. G., Woodland St., Everett, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Mach. Co., Cincinnati, Ohio.
Diamond Machine Co., Providence, R. I.
Garvin Mach. Co., Spring and Varick St., N. Y. C.
Gisholt Mach. Co., Madison, Wis.
Gould & Eberhardt, Newark, N. J.
Grand Rapids (Mich.) Grinding Mach. Co.
Greenfield Machine Co., Greenfield, Mass.
Greenfield Tap & Die Corp., Machy. Division, Greenfield, Mass.
Heald Machine Co., Worcester, Mass.
Hunter Saw & Machine Co., Pittsburgh, Pa.
Ingersoll Milling Machine Co., Rockford, Ill.
Landis Tool Co., Waynesboro, Pa.
LeBlond Mach. Tool Co., R. K., Cincinnati, O.
McDonough Mfg. Co., Eau Claire, Wis.
Modern Tool Co., Erie, Pa.
Noble & Westbrook Mfg. Co., Hartford, Conn
Norton Grinding Co., Worcester, Mass.
Oakley Mach. Tool Co., Cincinnati, Ohio
Oesterlein Mach. Co., Cincinnati, Ohio.
Pratt & Whitney Co., Hartford, Conn.
Royersford Fdry. & Mach. Co., Royersford, Pa.
Safety Emery Wheel Co., Springfield, Ohio.
Sellers & Co., Wm., Philadelphia, Pa.
Standard Tool Co., Cleveland, Ohio.
Sterling Grinding Wheel Co., Tiffin, Ohio.
Tabor Mfg. Co., Philadelphia, Pa.
Taylor & Fenn Co., Hartford, Conn.
Union Twist Drill Co., Athol, Mass.
U. S. Electrical Tool Co., Cincinnati Ohio.
Universal Grinding Mach. Co., Fitchburg, Mass.
Walker Co., O. S., Worcester, Mass.
Wilmarth & Morman Co., Grand Rapids, Mich.
Woods Engineering Co., Alliance, Ohio.

Grinding Machines, Cylindrical
Brown & Sharpe Mfg. Co. Providence, R. I.
Bryant Chucking Grinder Co., Springfield, Vt.



MODERN

Self-Contained Grinders for Rapid Work and Closest Accuracy

A good example of Modern Grinder efficiency is the job shown in illustration. It's a "close-up" photo taken in a large western plant—the work on machine being 3-in. x 3/16-in. piston rings.

Fifty-four rings are ground simultaneously at a working speed of 126 feet per minute. The reduction is made in two grinds. The first or rough grind takes off .020 in. and the production is 3600 rings every 10 hours. Second or finish grind reduces the diameter for heat expansion. Production on this grind is 3200 in 10 hours. Two operators handle the work, one loading the arbors, the other running the machine.

Powerful, heavy and rigid, Modern Self-Contained Grinders are especially adapted for rapid production and closest accuracy. For quantity manufacturing they have broken many production records formerly considered satisfactory.

The superior efficiency of Modern Grinders is recognized in the biggest plants of the country—automobile, general manufacturing, locomotive and munition work. They permit of higher speed, lower cost and give a better finish.

May we send you further details about Modern Grinder efficiency? We'll be glad to submit time estimates on your work.

Modern Tool Company, Fourth and French Streets, Erie, Pa.

New York Office, 2 Rector Street. Detroit Office, 1223 Dime Bank Bldg.
Chicago Office, 32 N. Clinton Street Cincinnati Office, 2 Greenwood Office Exchange
F. Wesley Parker, Export Dept., 2 Rector Street, New York City.

Cincinnati Grinder Co., Cincinnati, Ohio.
Detroit Tool Co., Detroit, Mich.
Fitchburg Grinding Mach. Co., Fitchburg, Mass.
Fraser Co., Warren F., Westboro, Mass.
Greenfield Machine Co., Greenfield, Mass.
Heald Machine Co., Worcester, Mass.
Landis Tool Co., Waynesboro Pa.
McDonough Mfg. Co., Eau Claire, Wis.
Manhattan Mach. Tool Wks., Grand Rapids, Mich.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Norton Grinding Co., Worcester, Mass.
Oesterlein Mach. Co., Cincinnati, Ohio.
Pratt & Whitney Co., Hartford, Conn.
Rivett Lathe & Grinder Co., Brighton, Boston.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Universal Grinding Mach. Co., Fitchburg, Mass.
Van Norman Mach. Tool Co., Springfield, Mass.
Walker Co., O. S., Worcester, Mass.
Webster & Perks Tool Co., Springfield, Ohio.
Whitney & Son, Baxter D., Winchendon, Mass.

Grinding Machines, Die
Abrasive Mach. Tool Co., East Providence, R. I.
Bignall & Keeler Mach. Works, Edwardsville, Ill.
Blake & Johnson Co., Waterbury Conn.
Blanchard Mach. Co., Cambridge, Conn.
Diamond Machine Co., Providence, R. I.
Fraser Co., Warren F., Westboro, Mass.
Gale-Sawyer Co., 33 Wormwood St., Boston.
Geometric Tool Co., New Haven, Conn.
Heald Mach. Co., Worcester, Mass.
Murchey Mach. & Tool Co., Detroit, Mich.
National Mach. Co., Tiffin, Ohio.
Noble & Westbrook Mfg. Co., Hartford, Conn.

Grinding Machines, Disc
Armstrong Bros. Tool Co., Chicago, Ill.
Besly & Co., Charles H., Chicago, Ill.
Diamond Machine Co., Providence, R. I.
Gardner Machine Co., Beloit, Wis.
G. S. Machine Tool Co., Fitchburg, Mass.
Landis Mach. Co., Waynesboro, Pa.
Rowbottom Machine Co., Waterbury, Conn.

Grinding Machines, Drill
Grand Rapids (Mich.) Grinding Mach. Co.
Greenfield Tap & Die Corp., Machy. Division, Greenfield, Mass.
La Salle Tool Co., La Salle, Ill.
Safety Emery Wheel Co., Springfield, Ohio.
Sellers & Co., Wm., Philadelphia, Pa.
Sterling Grinding Wheel Co., Tiffin, Ohio.
U. S. Elec. Tool Co., Cincinnati, Ohio.
Wilmarth & Morman Co., Grand Rapids, Mich.

Grinding Machines, Electric
Randsom Mfg. Co., Oshkosh, Wis.
Standard Elec. Tool Co., Cincinnati, O.

Grinding Machines, Face
Blanchard Machine Co., Cambridge, Mass.
Detroit Tool Co., Detroit, Mich.
Diamond Machine Co., Providence, R. I.
Ott Grinder Co., Indianapolis, Ind.
Persons-Arter Mach. Co., Worcester, Mass.

Grinding Machines, Floor and Tool
Blake & Johnson Co., Waterbury, Conn.
Blount Co., J. G., Woodland St., Everett, Mass.
Diamond Mach. Co., Providence, R. I.
Forbes & Myers, 170 Union St., Worcester, Mass.
G. S. Machine Tool Co., Fitchburg, Mass.
La Salle Tool Co., La Salle, Ill.
Manhattan Mach. Tool Wks., Grand Rapids, Mich.
Marschke Mfg. Co., Indianapolis, Ind.
Noble & Westbrook Mfg. Co., Hartford, Conn.
Norton Co., Worcester, Mass.
Coats Mach. Tool Co., 30 Church St., N. Y. City.
Patch & Sons Co., S. B., Streator, Ill.
Ransom Mfg. Co., Oshkosh, Wis.
Safety Emery Wheel Co., Springfield, Ohio.
Sterling Grinding Wheel Co., Tiffin, Ohio.
Webster & Perks Tool Co., Springfield, Ohio.

Grinding Machines, Gage
Abrasive Mach. Tool Co., East Providence, R. I.
Fraser Co., Warren F., Westboro, Mass.
Rivett Lathe & Grinder Co., Brighton, Boston.

Grinding Machines, Internal
Brown & Sharpe Mfg. Co., Providence, R. I.
Bryant Chucking Grinder Co., Springfield, Vt.
Fraser Co., Warren F., Westboro, Mass.
Gale-Sawyer Co., 33 Wormwood St., Boston.
Garvin Mach. Co., Spring and Varick St., N. Y. C.
Greenfield Machine Co., Greenfield, Mass.
Greenfield Tap & Die Corp., Machy. Division, Greenfield, Mass.
Heald Machine Co., Worcester, Mass.
Landis Tool Co., Waynesboro, Pa.
Lansing Stamp & Tool Co., Lansing, Mich.
Manhattan Mach. Tool Wks., Grand Rapids, Mich.
Pratt & Whitney, Hartford, Conn.
Rivett Lathe & Grinder Co., Brighton, Boston.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
U. S. Elec. Tool Co., Cincinnati, Ohio.
Universal Grinding Mach. Co., Fitchburg, Mass
Van Norman Mach. Tool Co., Springfield, Mass.
Walker Co., O. S., Worcester, Mass.
Whitney & Son, Baxter D., Winchendon, Mass.

Grinding Machines, Portable
Armstrong-Blum Mfg. Co., Chicago, Ill.
Chicago Pneumatic Tool Co., Chicago, Ill.
Clark Electric Co., Jas., Jr., Louisville, Ky.
Cleveland Pneumatic Tool Co., Cleveland, Ohio.
Gem Mfg. Co., Pittsburgh, Pa.
Neil & Smith Electric Tool Co., Cincinnati, Ohio.
Stow Mfg Co., Binghamton, N. Y.
U. S. Electric Tool Co., Cincinnati, Ohio.
Wisconsin Electric Co., Racine, Wis

Grinding Machines, Radial
Landis Tool Co., Waynesboro, Pa.
Rivett Lathe & Grinder Co., Brighton, Boston.
Van Norman Mach. Tool Co., Springfield, Mass.

Grinding Machines, Ring Wheel
Besly & Co., Charles H., Chicago, Ill.
Gardner Machine Co., Beloit, Wis.
Webster & Perks Tool Co., Springfield, Ohio.

Grinding Machines, Snagging
Blount Co., J. G., Woodland St., Everett, Mass.
Diamond Machine Co., Providence, R. I.
Patch & Sons Co., S. B., Streator, Ill.
Ransom Mfg. Co., Oshkosh, Wis.
Walker Co., O. S., Worcester, Mass.
Webster & Perks Tool Co., Springfield, Ohio.

Grinding Machines, Surface
Abrasive Mach. Tool Co., E. Providence, R. Il
Blanchard Machine Co., Cambridge, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Diamond Machine Co., Providence, R. I.
Fraser, Co., Warren F., Westboro, Mass.
Heald Machine Co., Worcester, Mass.
La Salle Tool Co., La Salle, Ill.
New Jersey Machy. Exchange, Newark, N. J.
Noble & Westbrook Mfg. Co., Hartford, Conn.
Persons-Arter Mach. Co., Worcester, Mass.
Pratt & Whitney Co., Hartford, Conn.
Rowbottom Machine Co., Waterbury, Conn.
Safety Emery Wheel Co., Springfield, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Universal Grinding Mach. Co., Fitchburg, Mass.
Walker Co., O. S., Grand Rapids, Mich.

Grinding Machines, Tool Post
Gale-Sawyer Co., 33 Wormwood St., Boston.

Grinding Machines, Universal
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Grinder Co., Cincinnati, Ohio.
Fraser, Co., Warren F., Westboro, Mass.
Grand Rapids (Mich.) Grinding Mch. Co.
Greenfield Machine Co., Greenfield, Mass.
Greenfield Tap & Die Corp., Machy. Division, Greenfield, Mass.
McDonough Mfg. Co., Eau Claire, Wiss.
Ott Grinder Co., Indianapolis, Ind.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Universal Grinding Mach. Co., Fitchburg Mass.
Webster & Perks Tool Co., Springfield, Ohio.
Wilmarth & Morman Co., Grand Rapids, Mich.
Woods Engineering Co., Alliance, Ohio.

Grinding Surface
Detroit Tool Co., Detroit, Mich.

Grinding Wheels
Abrasive Co., Bridesburg, Phila., Pa.
Dickinson, Thomas L., 64 Nassau St., N. Y. City.
Hampden Corundum Wheel Co., Springfield, Mass.
Maxf Grinding Wheel Co., Chester, Mass.
Norton Co., Worcester, Mass.
Sterling Grinding Wheel Co., Tiffin, Ohio.
Vitrified Wheel Co., Westfield, Mass.
Waltham Grinding Co., Waltham, Mass.

Grindstones and Frames
Oliver Machy. Co., Grand Rapids, Mich.

Guards, Abrasive Wheel
Webster & Perks Tool Co., Springfield, Ohio.

Gun Barrel Machinery
Sloan & Chace Mfg. Co., Newark, N. J.

Hammers, Drop
Bradley & Son, C. C. Syracuse, N. Y.
Detroit Twist Drill Co., Detroit.
Standard Gauge Steel Co., Beaver Falls, Penn
Barnes Drill Co., 830 Chestnut St., Rockford, Ill.
Erie Foundry Co., Erie, Pa.
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.
Toledo Mach. & Tool Co., Toledo, Ohio.

Hammers, Motor Driven
Nazel Engineering & Mach. Works, Philadelphia.
United Hammer Co., Boston, Mass.

Hammers, Pneumatic
Cleveland Pneumatic Tool Co., Cleveland, Ohio.
Independent Pneumatic Tool Co., Chicago, Ill.
Ingersoll-Rand Co., 11 Broadway, N. Y. City.

Hammers, Power
Bliss Co., E. W., 1 Adams St., Brooklyn, N. Y.
Bradley & Son, C. C., Syracuse, N. Y.
Erie Foundry Co., Erie, Pa.
Nazel Engineering & Mach. Works, Philadelphia.
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.
United Hammer Co., Boston, Mass.
West Tire Setter Co., Rochester, N. Y.

Hammers, Riveting and Chipping
Ingersoll-Rand Co., 11 Bway, N. Y. City.

Hangers, Shafting
Armstrong Bros. Tool Co., Chicago, Ill.
Bond Foundry & Machine Co., Manheim, Pa.
Gurney Ball Bearing Co., Jamestown, N. Y.
Hess-Bright Mfg. Co., Philadelphia, Pa.
Hyatt Roller Bearing Co., Harrison, N. J.
New Departure Mfg. Co., Bristol, Ct.
Royersford Foundry & Mach. Co., Royersford, Pa.

Hardening, Case-Hardening and Tempering
Bennett, W. R., Elmwood, Conn.
Garwood Bronze & Iron Works, Garwood, N. J.
Steel Improvement & Forge Co., Cleveland.
Williams & Co., J. .H 35 Richards St., Brooklyn.

Hardness Testing Apparatus
Shore Instrument & Mfg. Co., N. Y. City.

Heating & Ventilating Equipment
American Blower Co., Detroit, Mich.

Hobbing Machines
Adams Co., 1901 Bridge St., Dubuque, Iowa.
Barber-Colman Co., Rockford, Ill.
Bilton Mach. Tool Co., Bridgeport, Conn.
Gould & Eberhardt, Newark, N. J.
M-C Mfg. Co., 28 Congress St., Newark, N. J.
Newton Machine Tool Works, Philadelphia, Pa.

Hobs
Barber-Colman Co., Rockford, Ill.
Boston Gear Works, Norfolk Downs, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Goddard Tool Co., Chicago, Ill.
Gould & Eberhardt, Newark, N. J.
Greenfield Tap & Die Corp., Greenfield, Mass.
National Tool Co., Cleveland, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

Hoists, Electric
Crocker-Wheeler Co., Ampere, N. J.

Link-Belt Co., Chicago, Philadelphia.
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.
Northern Engineering Works, Detroit, Mich.
Pawling & Harnischfeger Co., Milwaukee, Wis.
Shepard Electric C. & H. Co., Montour Falls, N. Y.
Sprague Electric Wks., 527 W. 34th St., N. Y. C.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.
Yale & Towne Mfg. Co., 9 E. 40th St., N. Y. C.

Hoists, Hand
Caldwell & Son Co., H. W., Chicago, Ill.
Canton Foundry & Machine Co., Canton, Ohio.
Chisholm-Moore Mfg. Co., Cleveland, O.
Ford Chain Block & Mfg. Co., Philadelphia, Pa.
Harrington, Son & Co., Edwin, Phila., Penn.
Reading Chain Block Co., Reading, Penn.
Wright Mfg. Co., Lisbon, Ohio.
Yale & Towne Mfg. Co., 9 E. 40th St., N. Y. C.

Hoists, Pneumatic
Ingersoll-Rand Co., 11 Broadway, N. Y. City.
Whiting Foundry Equipment Co., Harvey, Ill
Worthington Pump & Machy. Corp., N. Y.

Hose Steel
Sprague Electric Wks., 527 W. 34th St., N. Y. C.

Hydraulic Leather
Schieren Co., Chas. A., 41 Ferry St., N. Y. City.

Hydraulic Machinery
Burroughs Co., The Chas., Newark, N. J.
Worthington Pump & Machy. Corp., N. Y.

Igniters, Gas Engine
Doehler Die Casting Co., Brooklyn, N. Y.

Index Centers
Simmons Mach. Co., Inc., Albany, N. Y.

Indicators, Speed and Test
Brown & Sharpe Mfg. Co., Providence, R. I.
Holtzer-Cabot Electric Co., Boston.
Johnson & Miller, 42 Murray St., N. Y. City.
Marvin & Casler Co., Canastota, N. Y.
Norton Grinding Co., Worcester, Mass.
Veeder Mfg. Co., 15 Sargeant St., Hartford, Conn.
Waterston, J. M., 77 Woodward Ave., Detroit.

Inspectors
Souther Engineering Corp., Ry., Hartford, Conn.

Jacks, Hydraulic
Dudgeon, Richard, N. Y. City.
Watson-Stillman Co., 42 Church St., N. Y. C.

Jacks, Planer
Armstrong Bros. Tool Co., Chicago, Ill.

Japans
Hilo Varnish Corporation, 8 Gerry St., Brooklyn.

Jigs and Fixtures (See Tool Work)

Kettles, Soda
Brown & Sharpe Mfg. Co., Providence, R. I.
Gray & Prior Mach. Co., Hartford, Conn.
Manufacturing Equipment & Engineering Co., Framingham, Mass.

Keyseating Machines
Baker Bros., Toledo, Ohio.
Lapointe Co., J. N., New London, Conn.
Lapointe Machine Tool Co., Hudson, Mass.
Mills & Merrill, Saginaw, Mich.
Morton Mfg. Co., Muskegon Heights, Mich.
Newton Machine Tool Wks., Philadelphia, Penn.
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.

Keys, Machine
National Machine Tool Co., Cincinnati, Ohio.
Whitman & Barnes Mfg. Co., Akron, Ohio.
Williams & Co., J. H., 35 Richards St., Brooklyn.

Knurl Holders
Graham Mfg. Co., Providence, R. I.
Williams & Co., J. H., 35 Richards St., Brooklyn.

Knives, Machine
Simonds Mfg. Co., Fitchburg, Mass.

Lacing Leather
Schieren Co., Chas. A., 41 Ferry St., N. Y. City.

Lamps, Electric
General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

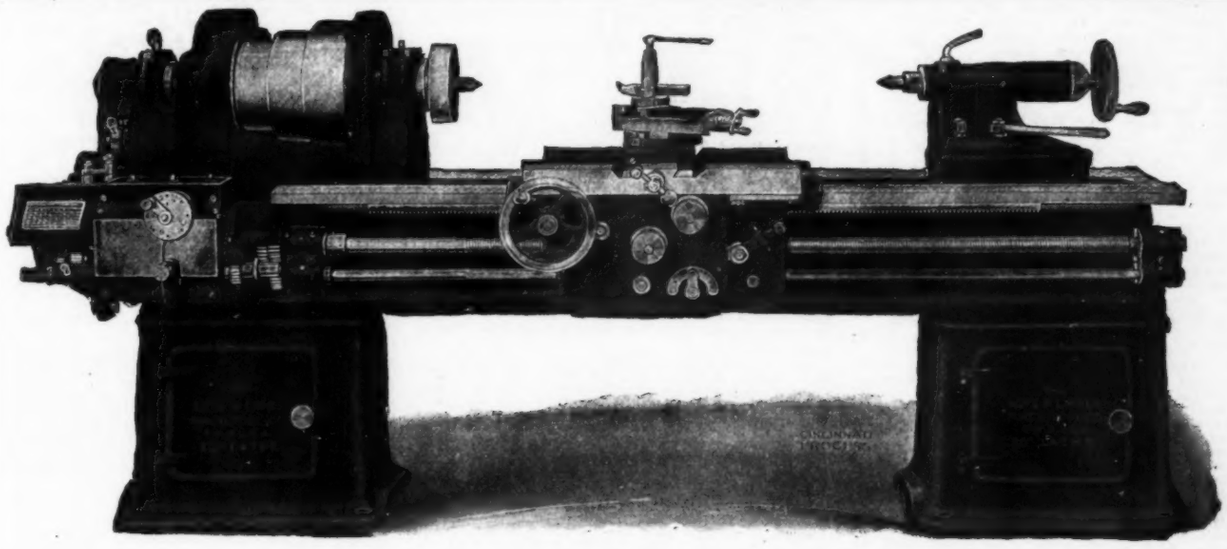
Lathe Attachments
Ames Co., B. C., Waltham, Mass.
Dalton Mfg. Corp., 1911 Park Ave., N. Y. City.
Flather & Co., Inc., Nashua, N. H.
Hendey Mach. Co., Torrington, Ct.
Newman Mfg. Co., 717 Sycamore St., Cincinnati.
Rivett Lathe & Grinder Co., Brighton, Boston.
Sloan & Chace Mfg. Co., Newark, N. J.
William & Co., J. H., 35 Richards St., Brooklyn.

Lathe Pans, Portable
New Britain Machine Co., New Britain, Conn.

Lathe Tools
Armstrong Bros. Tool Co., Chicago, Ill.
Gisholt Mach. Co., Madison, Wis.
Lovejoy Tool Co., Springfield, Vt.
Union Tool Co., Orange, Mass.
Western Tool & Mfg. Co., Springfield, Ohio.
Williams & Co., J. H., 35 Richards St., Brooklyn.

Lathes, Automatic and Semi-Automatic
Gisholt Mach. Co., Madison, Wis.
Jones & Lamson Mach. Co., Springfield, Vt.
National Acme Co., Windsor, Vt.
Potter & Johnston Mach. Co., Pawtucket, R. I.
Reed-Prentice Co., Worcester, Mass.
Steinle Turret Mach. Co., Madison, Wis.
Wood Turret Mach. Co., Brazil, Ind.

Lathes, Bench
Ames Co., B. C., Waltham, Mass.
Blount Co., J. G., Woodland St., Everett, Mass.
Dalton Mfg. Corp., 1911 Park Ave., N. Y. City.
Diamond Mach. Co., Providence, R. I.
Greenfield Tap & Die Corp., Machy. Division, Greenfield, Mass.
Oliver Mfg. Co., W. W., Buffalo, N. Y.
Potter Tool & Mach. Wks., 79 E. 130 St., N. Y.
Pratt & Whitney Co., Hartford, Conn.
Rivett Lathe & Grinder Co., Brighton, Boston.
Seneca Falls Mfg. Co., Seneca Falls, N. Y.



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Van Norman Mach. Tool Co., Springfield, Mass.
Waltham Mach. Works, Waltham, Mass.

Lathes, Boring
Bridgeford Mach. Tool Wks., Rochester, N. Y.
Gisholt Mach. Co., Madison, Wis.
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.
Potter & Johnston Mach. Co., Pawtucket, R. I.

Lathes, Chucking (See Lathes, Horizontal Turret)

Lathes, Engine
Acme Mach. Tool Co., Cincinnati, Ohio.
American Tool Wks. Co., Cincinnati, Ohio.
Barnes Co., W. F. & John, Rockford, Ill.
Barnes Drill Co., 830 Chestnut St., Rockford, Ill.
Blount Co., J. G., Woodland St., Everett, Mass.
Boye & Emmes Mach. Tool Co., Cincinnati, O.
Bradford Machine Tool Co., Cincinnati, Ohio.
Bridgeford Machine Tool Wks., Rochester, N. Y.
Bullard Machine Tool Co., Bridgeport, Conn.
Carroll-Jamieson Mach. Tool Co., Batavia, Ohio.
Champion Tool Works Co., Cincinnati, Ohio.
Chard Lathe Co., Newcastle, Ind.
Cincinnati Lathe & Tool Co., Cincinnati, Ohio.
Coats Mach. Tool Co., 30 Church St., N. Y. C.
Crawford Machine Tool Co., 21 Park Row, N. Y.
Dalton Mfg. Corp., 1911 Park Ave., N. Y. City.
Davenport Locomotive Wks., Davenport, Iowa.
Earle Gear & Machine Co., Philadelphia, Pa.
Fitchburg Machine Works, Fitchburg, Mass.
Flather & Co., Nashua, N. H.
Giddings & Lewis Mfg. Co., Fond du Lac, Wis.
Gisholt Mach Co., Madison, Wis.
Greaves, Klusman Tool Co., Cincinnati, Ohio.
Hamilton Machine Tool Co., Hamilton, Ohio.
Hendey Machine Co., Torrington, Conn.
Hill, Clarke & Co., 156 Oliver St., Boston, Mass.
Houston Stanwood & Gamble Co., Cincinnati, O.
LeBlond Mach. Tool Co., The R. K., Cincinnati.
Lodge & Shipley Machine Tool Co., Cincinnati..
Monarch Mach. Tool Co., Sidney, Ohio.
Morris Machines Tool Co., Cincinnati, Ohio.
Mueller Mach. Tool Co., Cincinnati, Ohio.
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.
Oliver Machy. Co., Grand Rapids, Mich.
Pittsburgh Mach. Tool Co., Braddock, Penn.
Prentiss & Co., Henry, Singer Bldg., N. Y. City.
Pryibil Mach. Co., P., 512 W. 41st St., N. Y. C.
Reed-Prentice Co., Worcester, Mass.
Rockford Drilling Mach. Co., Rockford, Ill.
Sebastian Lathe Co., 117 Culvert St., Cincinnati.
Seneca Falls Mfg. Co., Seneca Falls, N. Y.
Shepard Lathe Co., Cincinnati, Ohio.
Sidney Mach. Tool Co., Sidney, O.
Smith Mfg. Co., Philip, Sidney, Ohio.
South Bend Lathe Works, South Bend, Ind.
Springfield Mach. Tool Co., Springfield, Ohio.
Strong, Carlisle & Hammond Co., Cleveland, O.
Toomey, Frank, 127 N. 3rd St., Philadelphia.
Walcott Lathe Co., Jackson, Mich.
Whitcomb-Blaisdell Mach. Tool Co., Worcester.
Wickes Bros., Saginaw, Mich.
Willard Mach. Tool Co., Cincinnati, O.
Worcester Lathe Co., Worcester, Mass.

Lathes, Extension and Gap
American Tool Wks., Co., Cincinnati, Ohio.
Harrington, Son & Co., Edwin, Philadelphia, Pa.
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.
South Bend Lathe Works, South Bend, Ind.

Lathes, Foot Power
Barnes Co., W. F. & John, Rockford, Ill.
Dalton Mfg. Corp., 1911 Park Ave., N. Y. City.
Seneca Falls Mfg. Co., Seneca Falls, N. Y.
Shepard Lathe Co., Cincinnati, Ohio.

Lathes, Heavy Duty Projectile Boring
Cincinnati Pulley Machy. Co., Cincinnati, Ohio.
Nielsen & Winther, Ltd., 59 Pearl St., City.
Pittsburgh Mach. Tool Co., Braddock, Penn.
Taylor Mach. Co., Cleveland, O.

Lathes, Horizontal Turret
Acme Machine Tool Co., Cincinnati, Ohio.
American Tool Wks., Cincinnati, Ohio.
Bradford Mach. Tool Co., Cincinnati, Ohio.
Bridgeford Mach. Tool Wks., Rochester, N. Y.
Champion Tool Works Co., Cincinnati, Ohio.
Dreses Mach. Tool Co., Cincinnati, Ohio.
Foster Mach. Co., Elkhart, Ind.
Gisholt Mach. Co., Madison, Wis.
International Mach. Tool Co., Indianapolis, Ind.
Jones & Lamson Mach. Co., Springfield, Vt.
LeBlond Mach. Tool Co., The R. K., Cincinnati.
Lodge & Shipley Mach. Tool Co., Cincinnati, O.
Oliver Machy. Co., Grand Rapids, Mich.
Pratt & Whitney Co., Hartford, Conn.
Reed-Prentice Co., Worcester, Mass.
Rivett Lathe & Grinder Co., Brighton, Boston.
Southworth Mach. Co., Portland, Me.
Springfield Mach. Tool Co., Springfield, Ohio.
Steinle Turret Mach. Co., Madison, Wis.
Turner Machine Co., Danbury, Conn.
Warner & Swasey Co., Cleveland, Ohio.
Wood Turret Mach. Co., Brazil, Ind.

Lathes, Manufacturers'
Davenport Locomotive Wks., Davenport, Iowa.
Greenfield Tap & Die Corp., Greenfield, Mass.

Lathes, Polishing (See Polishing and Buffing Machines)

Lathes, Projectile Boring
Bridgeford Mach. Tool Wks., Rochester, N. Y.

Lathes, Relieving
Cleveland Milling Mach. Co., Cleveland, Ohio.

Lathes, Speed and Hand
Blount Co., J. G., Woodland St., Everett, Mass.
Diamond Machine Co., Providence, R. I.
Garvin Machine Co., N. Y. City.
Greenfield Tap & Die Corp., Machy. Division, Greenfield, Mass.
Oliver Machinery Co., Grand Rapids, Mich.
Seneca Falls Mfg. Co., Seneca Falls, N. Y.

Lathes, Spinning
Pryibil Mach. Co., P., 512 W. 41st St., N. Y. C.

Lathes, Threading
Automatic Mach. Co., Bridgeport, Conn.
Rivett Lathe & Grinder Co., Brighton, Boston.
Sloan & Chace Mfg. Co., Newark, N. J.

Lathes, Vertical Turret
Bullard Mach. Tool Co., Bridgeport, Conn.
Turner Machine Co., Danbury, Conn.

Lathes, Wood Turning
Barnes Co., W. F. & John, Rockford, Ill.
Blount Co., J. B., Woodland St., Everett, Mass.
Oliver Machy. Co., Grand Rapids, Mich.
Seneca Falls Mfg. Co., Seneca Falls, N. Y.

Letters and Figures
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Pannier Bros. Stamp Co., Pittsburgh, Penn.

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Manufacturing Equipment & Engineering Co., Framingham, Mass.

Locomotive Box Boring Machines
Newton Mach. Tool Works, Philadelphia, Penn.

Lubricants
Dixon Crucible Co., Joseph, Jersey City, N. J.
Fiske Bros. Refining Co., 24 State St., N. Y. C.
Oakley Chemical Co., 24 Thames St., N. Y. City.
Texas Co., 17 Battery Place, N. Y.
White & Bagley Co., Worcester, Mass.

Lubricating Systems
Bowser & Co., S. F., Fort Wayne, Ind.

Machinists' Small Tools
Armstrong Bros. Tool Co., Chicago, Ill.
Athol Machine Co., Athol, Mass.
Billings & Spencer Co., Hartford, Conn.
Brown & Sharpe Mfg. So., Providence, R. I.
Garvin Mach. Co., Spring & Varick Sts., N. Y. C.
Greenfield Tap & Die Corp., Greenfield, Mass.
Grover File Co., Nashua, N. H.
Hammacher, Schlemmer & Co., N. Y. City.
Harrington Son & Co., Inc., Edwin, Phila., Penn.
Kar Engineering Co., N. Y. City.
Lincoln Twist Drill Co., The, Taunton, Mass.
Marvin & Casler Co., Canastota, N. Y.
Mehl Mach. Tool & Die Co., Roselle, N. J.
Pratt & Whitney Co., Hartford, Conn.
Randall & Stickney, Waltham, Mass.
Reliance Steel & Tool Co., 24 Murray St., N. Y.
Slocomb Co., J. T., Providence, R. I.
Standard Tool Co., Cleveland, Ohio.
Starrett Co., L. S., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Thrift Mfg. Co., 24 1st St., Freeport, Ill.
Union Tool Co., Orange, Mass.
Williams & Co., J. H., 35 Richards St., Brooklyn.

Mandrels, Expanding
Manufacturers Equipment Co., Chicago, Ill.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Nicholson & Co., W. H., Wilkes-Barre, Penn.
Western Tool & Mfg. Co., Springfield, Ohio.

Mandrels, Solid
Advance Tool Co., Cincinnati, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Twist Drill Co., Cleveland, O.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Detroit.
Nicholson & Co., W. H., Wilkes-Barre, Penn.
Standard Tool Co., Cleveland, Ohio.

Marking Devices (See Stamps, Steel)

Marking Machines
Noble & Westbrook Mfg. Co., Hartford, Conn.

Measuring Machines
Norma Co. of America, 1790 Broadway, N. Y. C.
Pratt & Whitney Co., Hartford, Conn.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

Metal Finishes
Hilo Varnish Corporation, 8 Gerry St., Brooklyn.

Meters, Steam Flow
General Electric Co., Schenectady, N. Y.

Micrometer Calipers
Almond Mfg. Co., T. R., Ashburnham, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Randall & Stickney, Waltham, Mass.
Slocomb Co., J. T., Providence, R. I.
Starrett Co., L. S., Athol, Mass.

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Becker Milling Machine Co., Hyde Park, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Mach. Co., Cincinnati, Ohio.
Cleveland Milling Mach. Co., Cleveland, Ohio.
Dow Mfg. Co., Braintree, Mass.
Fox Machine Co., Jackson, Mich.
Garvin Mach. Co., Spring & Varick Sts., N. Y. C.
Hendey Machine Co., Torrington, Conn.
Ingersoll Milling Machine Co., Rockford, Ill.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
LeBlond Mach Tool Co., R. K., Cincinnati, O.
Oesterlein Mach. Co., Cincinnati, Ohio.
Potter & Johnston Mach. Co., Pawtucket, R. I.
Sloan & Chace Mfg. Co., Newark, N. J.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

Milling Machines, Automatic
Bilton Mach. Tool Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio
Cleveland Milling Mach. Co., Cleveland, Ohio.
Pratt & Whitney Co., Hartford, Conn.

Milling Machines, Bench
Ames Co., B. C., Waltham, Mass.
Carter & Hakes Machine Co., Winsted, Conn.
Cleveland Milling Mach. Co., Cleveland, Ohio.
Pratt & Whitney Co., Hartford, Conn.
Sloan & Chace Mfg. Co., Newark, N. J.
Stark Tool Co., Waltham, Mass.
Van Norman Mach. Tool Co., Springfield, Mass.

Milling Machines, Hand
Adams Co., 1902 Bridge St., Dubuque, Iowa.
Becker Milling Mach. Co., Hyde Park, Mass.
Carter & Hakes Mach. Co., Winsted, Conn.
Cincinnati Milling Mach. Co., Cincinnati, Ohio.
Cleveland Milling Mach. Co., Cleveland, Ohio.
Fox Machine Co., Jackson, Mich.
Garvin Mach. Co., Spring & Varick Sts., N. Y. C.
Pratt & Whitney Co., Hartford, Conn.
Standard Engineering Co., Pawtucket, R. I.
Steptoe Co., John, Northside, Cincinnati, Ohio
Van Norman Mach. Tool Co., Springfield, Mass.
Whitney Mfg. Co., Hartford, Conn.
Wisconsin Miller Mfg. Co., Station A, Milwaukee.

Milling Machines, Horizontal and Planer Type
Adams Co., 1902 Bridge St., Dubuque, Iowa.
Beaman & Smith Co., Providence, R. I.
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Betts Machine Co., Rochester, N. Y.
Chicago Mach. Tool Co., Chicago, Ill.
Cleveland Milling Mach. Co., Cleveland, Ohio.
Hill Clarke & Co., 156 Oliver St., Boston, Mass.
Ingersoll Milling Mach. Co., Rockford, Ill.
Newton Mach., Tool Works, Philadelphia, Penn.
Niles-Bement-Pond Co., 111 Broadway, N .Y. C.

Milling Machines, Oil Grooving
National Machine Tool Co., Cincinnati, Ohio.

Milling Machines, Plain
Adams Co., 1902 Bridge St., Dubuque, Iowa.
Becker Milling Mach. Co., Hyde Park, Mass.
Betts Machine Co., Rochester, N. Y.
Bilton Mach. Tool Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R. I.
Chicago Mach. Tool Co., Chicago, Ill.
Cincinnati Milling Mach. Co., Cincinnati, Ohio.
Coats Mach. Tool Co., 30 Church St., N. Y. City.
Cleveland Milling Mach Co., Cleveland, Ohio.
Dow Mfg. Co., Braintree, Mass.
Fox Machine Co., Jackson, Mich.
Garvin Machine Co., N. Y. City.
Gooley & Edlund, Cortland, N. Y.
Hendey Machine Co., Torrington, Conn.
Hill, Clarke & Co., 156 Oliver St., Boston, Mass.
Ingersoll Milling Mach. Co., Rockford, Ill.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Station A, Milwaukee, Wis.
LeBlond Mach. Tool Co., The R. K., Cincinnati,
Newton Mach. Tool Works, Philadelphia, Penn.
Oesterlein Mach. Co., Cincinnati, Ohio.
Potter & Johnston Mach. Co., Pawtucket, R. I.
Steptoe Co., John, Northside, Cincinnati, Ohio.
Van Norman Mach. Tool Co., Springfield, Mass.

Milling Machines, Portable
Newton Mach. Tool Works, Philadelphia, Penn.
Underwood & Co., H. B., Philadelphia, Penn.

Milling Machines, Thread
Automatic Mach. Co., The, Bridgeport, Conn.
Gisholt Mach. Co., Madison, Wis.
Gray Mach. Tool Co., Buffalo, N. Y.
Foster Mach. Co., Elkhart, Ind.
Hall Gas Engine Co., Bridesburg, Philadelphia.
Harrington Son & Co., Edwin, Philadelphia, Pa
Lees-Bradner Co., Cleveland, Ohio.
Pratt & Whitney Co., Hartford, Conn.
Waltham Mach. Works, Waltham, Mass.

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Becker Milling Mach. Co., Hyde Park, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Mach. Co., Cincinnati, Ohio.
Cleveland Milling Mach. Co., Cleveland, Ohio.
Dow Mfg. Co., Braintree, Mass.
Fox Machine Co., Jackson, Mich.
Garvin Mach. Co., N. Y. City.
Hendey Mach. Co., Torrington, Conn.
Hill, Clarke & Co., 156 Oliver St., Boston, Mass.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Station A, Milwaukee, Wis.
LeBlond Mach. Tool Co., R. K., Cincinnati, Ohio.
Newton Mach. Tool Works, Philadelphia, Pa.
Oesterlein Mach. Co., Cincinnati, Ohio.
Potter & Johnson Machine Co., Pawtucket, R. I.
Van Norman Mach. Tool Co., Springfield, Mass.

Milling Machines, Vertical
Adams Co., 1902 Bridge St., Dubuque, Iowa.
Becker Milling Mach. Co., Hyde Park, Mass.
Betts Machine Co., Rochester, N. Y.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Mach. Co., Cincinnati, Ohio.
Cleveland Milling Mach. Co., Cleveland, Ohio.
Clough, R. M., Meriden, Conn.
Garvin Machine Co., N. Y. City.
Hill, Clarke & Co., 156 Oliver St., Boston, Mass.
Ingersoll Milling Mach. Co., Rockford, Ill.
Kearney & Trecker Co., Milwaukee, Wis.
Knight Mach. Co., 3920 W. Pine St., St. Louis.
LeBlond Mach. Tool Co., The R. K., Cincinnati.
Newton Mach. Tool Works, Philadelphia, Pa.
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.
Potter & Johnston Mach. Co., Pawtucket, R. I.
Van Norman Mach. Tool Co., Springfield, Mass.

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Cleveland Auto. Mach. Co., Cleveland, Ohio.
Newton Mach. Tool Works, Philadelphia, Pa.
Waltham Mach. Works, Waltham, Mass.

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Crocker-Wheeler Co., Ampere, N. J.
Electro-Dynamic Co., Bayonne, N. J.
General Electric Co., Schenectady, N. Y.
Haltzer-Cabot Electric Co., Boston.
Mechanical Appliance Co., Milwaukee, Wis.
Reliance Electric & Engineering Co., Cleveland
Sprague Electric Works, N. Y. City.
Stow Mfg. Co., Binghamton, N. Y.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.
Wisconsin Electric Co., Racine, Wis.

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Nuts, Lock (See Lock-Nuts)

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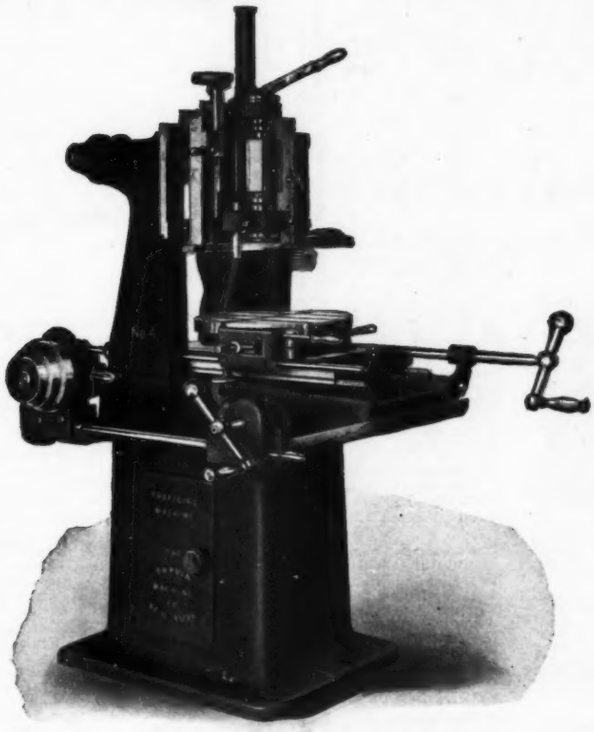
Bowen Products Corp., Auburn, N. Y.
Michigan Lubricator Co., Detroit, Mich.
Tucker, W. A. & C. F., Hartford, Conn.
Wahlstrom Tool Co., Brooklyn, N. Y.

Oilers
Gem Mfg. Co., Pittsburgh, Penn.
Michigan Lubricator Co., Detroit, Mich.

GARVIN No. 4 Profiling Machine



Garvin No. 4 Profiling Machine

Use Code....Baggage

Suitable for all kinds of profiling, circular milling, etc.

This machine, as will be noticed, is provided with power feed and reverse to both the main table and rotary table. Both tables have automatic trips for throwing out the feed, and the main table has in combination a positive stop. The power feed is taken from a cone pulley on the countershaft direct to a cone, as shown to the left of the machine.

There are six changes of feed, all being under cover, and free from accident to themselves or the operator.

The machine is nicely arranged for the use of lubricant on the work, pump and piping may be provided as an extra.

DIMENSIONS

Working Surface of Table	**15¾ x 24 in.**
Movement of Table	**24 in.**
Movement of Cross-Slide	**14 in.**
Distance from Table to Cross-Slide	**10½ in.**
Distance from Rotary Table to Cross-Slide	**7⅛ in.**
Distance between Uprights	**16 in.**
Domestic Shipping Weight	**2450 lb.**

Prompt Deliveries. For further information ask your dealer or write us direct.

Manufactured by

THE GARVIN MACHINE COMPANY

Spring and Varick Streets. 50 Years in NEW YORK CITY

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Norton Co., Worcester, Mass.

Oil Storage Engineers
Gilbert & Barker Mfg. Co., Springfield, Mass.

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Texas Co., 17 Battery Place, N. Y.
White & Bagley Co., Worcester, Mass.

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International Oxygen Co., 115 Bway., N. Y. C.

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Phosphor Bronze Smelting Co., Philadelphia.

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Treadwell Eng'g. Co., 88 West St., N. Y. City.
Underwood & Co., H. B., Philadelphia, Penn.

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Bignall & Keeler Mach. Wks., Edwardsville, Ill.
Curtis & Curtis Co., Bridgeport, Conn.
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Harrington, Son & Co., Edwin, Philadelphia, Pa.
Landis Mach. Co., Waynesboro, Penn.
Merrell Mfg. Co., Toledo, Ohio.
Murchey Mach. & Tool Co., Detroit, Mich.
Saunders Sons, D., Yonkers, N. Y.
Standard Eng'g. Wks., Ellwood City, Penn.
Treadwell Eng'g. Co., 88 West St., N. Y. City.
Trimont Mfg. Co., Roxbury, Mass.

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Cleveland Twist Drill Co., Cleveland, O.
Greenfield Tap & Die Corp., Greenfield, Mass.
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Standard Tool Co., Cleveland, Ohio.
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Potter & Johnston Mach. Co., Pawtucket, R. I.
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Walker Co., O. S., Worcester, Mass.

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Walker Co., O. S., Worcester, Mass.

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Cincinnati Planer Co., Cincinnati, Ohio.
Cleveland Planer Co., Cleveland, Ohio.
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Gray Co., G. A., Cincinnati, Ohio.
Hamilton Mach. Tool Co., Hamilton, Ohio.
Hill, Clarke & Co., 156 Oliver St., Boston, Mass.
Lynd Farquhar Co., Boston, Mass.
Newton Mach. Tool Wks., Philadelphia, Penn.
Niles-Bement-Pond Co., 111 Broadway, N. Y. C
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Prentiss & Co., Henry, Singer Bldg., N. Y. City.
Sellers & Co., Wm., Philadelphia, Penn.
Strong, Carlisle & Hammond Co., Cleveland, O.
Toomey, Frank, 127 N. 3d St., Philadelphia, Pa.
Whitcomb-Blaisdell Mach. Tool Co., Worcester.

Planing Machines, Rotary
Newton Mach. Tool Wks., Philadelphia, Penn.
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Underwood & Co., H. B., Philadelphia, Penn.

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Hubbard Spring Co., M. G., Pontaic, Mich.

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Greenfield Mach. Co., Greenfield, Mass.
Greenfield Tap & Die Corp., Machy. Division, Greenfield, Mass.
Heald Mach. Co., Worcester, Mass.
Holtzer-Cabot Electric Co., Boston.
Landis Tool Co., Waynesboro, Penn.
New Britain Mach. Co., New Britain, Conn.
Newton Mach. Tool Wks., Philadelphia, Penn.
Noble & Westbrook Mfg. Co., Hartford, Conn.
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Potter Tool & Mach. Wks., 79 E. 130 St., N. Y.
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Royersford Fdry. & Mach. Co., Royersford, Pa.
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Niles-Bement-Pond Co., 111 Bway., N. Y. City.
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Shuster Co., F. B., New Haven, Conn.
Taylor & Penn Co., Hartford, Conn.

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Bliss Co., E. W., 1 Adams St., Brooklyn, N. Y.
Lucas Mach. Tool Co., Cleveland, Ohio.
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Dudgeon, Richard, N. Y. City.
Elmes Engineering Wks., Chas. F., Chicago.
Hydraulic Press Mfg. Co., Mt. Gilead, Ohio.
Metalwood Mfg. Co., Detroit, Mich.
Niles-Bement-Pond Co., 111 Bway., N. Y. City.
Watson-Stillman Co., 42 Church St., N. Y. City.

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Blake & Johnson Co., Waterbury, Conn.
Bliss Co., E. W., 1 Adams St., Brooklyn, N. Y.
Ferracute Mach. Co., Bridgeton, N. J.
Harris Eng'g. Co., H. E., Bridgeport, Conn.
Niagara Mach. & Tool Wks., Buffalo, N. Y.
Rowbottom Mach. Co., Waterbury, Conn.
Toledo Mach. & Tool Co., Toledo, Ohio.
Stoll Co., Inc., D. H., Buffalo, N. Y.

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Bliss Co., E. W., 1 Adams St., Brooklyn, N. Y.
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Watson-Stillman Co., 42 Church St., N. Y. City.

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Ferracute Mach. Co., Bridgeton, N. J.
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Prentiss & Co., Henry, Singer Bldg., N. Y. City.
Royersford Fdry. & Mach. Co., Royersford, Pa.

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Modern Mfg. Co., Bridgeport, Conn.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

Reamers, Solid
Advance Tool Co., Cincinnati, Ohio.
Bay State Tap & Die Co., Mansfield, Mass.
Brewster Co., Wm., 30 Church St., N. Y. City.
Brubaker & Bros., W. L., 50 Church St., N. Y. C.
Buckeye Twist Drill Co., Alliance, Ohio.
Butterfield & Co., Derby Line, Vt.
Clark Equipment Co., Buchanan, Mich.
Clough, R. M., Meriden, Conn.
Gale-Sawyer Co., 33 Wormwood St., Boston.
Greenfield Tap & Die Corp., Greenfield, Mass.
Lincoln Twist Drill Co., The, Taunton, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Tool Co., Cleveland, Ohio.
National Twist Drill & Tool Co., Detroit.
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Skelton Sales Co., Syracuse, N. Y.
Standard Tool Co., Cleveland, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Union Twist Drill Co., Athol, Mass.
Western Tool & Mfg. Co., Springfield, Ohio.

Reamers, Taper
Lincoln Twist Drill Co., The, Taunton, Mass.

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Diamond Saw & Stamping Wks., Buffalo, N. Y.
Eagle Gear & Mach. Co., Philadelphia, Penn.
Greenfield Tap & Die Corp., Machy. Division, Greenfield, Mass.
Napier Saw Wks., Springfield, Mass.
Newton Mach. Tool Wks., Philadelphia, Penn.
PeerlessMach. Co., Racine, Wis.
Racine Tool & Mach. Co., Racine, Wis.
Simonds Mfg. Co., Fitchburg, Mass.
Swind Machinery Co., Philadelphia, Pa.
Union Twist Drill Co., Athol, Mass.
Vandyck Churchill Co., 93 Liberty St., N. Y. C.
Victor Saw Wks., Springfield, Mass.
West Haven Mfg. Co., New Haven, Conn.

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Diamond Saw & Stamping Wks., Buffalo, N. Y.
Napier Saw Wks., Springfield, Mass.
Peerless Mach. Co., Racine, Wis.
Racine Tool & Mach. Co., Racine, Wis.
Thompson & Son Co., Hy. G., New Haven, Conn.
Victor Saw Wks., Springfield, Mass.
West Haven Mfg. Co., New Haven, Conn.
Western Tool & Mfg. Co., Springfield, Mass.

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Greenfield Tap & Die Corp., Machy. Division, Greenfield, Mass.
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Barber-Colman Co., Rockkford, Ill.
Hunter Saw & Machine Co., Pittsburgh, Penn.
Huther Bros. Saw Mfg. Co., Rochester, N. Y.
Napier Saw Wks., Springfield, Mass.
Pratt & Whitney Co., Hartford, Conn.
Union Twist Drill Co., Athol, Mass.

Saws, Hand
Reliance Steel & Tool Co., 24 Murray St., N. Y.

Saws, Metal Band
Garvin Machine Co., N. Y. City.
Hunter Saw & Mach. Co., Pittsburgh, Penn.
Napier Saw Wks., Springfield, Mass.
Racine Tool & Mach. Co., Racine, Wis.
Silver Mfg. Co., Salem, Ohio.
Simonds Mfg. Co., Fitchburg, Mass.

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Hunter Saw & Mach. Co., Pittsburgh, Penn.
Napier Saw Wks., Springfield, Mass.
Reliance Steel & Tool Co., 24 Murray St., N. Y.

Saws, Screw Slotting
Atkins & Co., C. E., Indianapolis, Ind.
Brown & Sharpe Mfg. Co., Providence, R. I.
Pratt & Whitney Co., Hartford, Conn.
Reliance Steel & Tool Co., 24 Murray St., N. Y.
Simonds Mfg. Co., Fitchburg, Mass.
Starrett Co., L. S., Athol, Mass.
Thurston Mfg. Co., Providence, R. I.
Union Twist Drill Co., Athol, Mass.

Saw Tables, Universal
Baker Bros., Toledo, Ohio.
Silver Mfg. Co., Salem, Ohio.

Screw-Machine Work
American Brass Forging Co., N. Y. City.
Ansonia Mfg. Co., Ansonia, Conn.
Barnes Co., Wallace, 38 Wallace St., Bristol, Ct.
Brown Bag Filling Mach. Co., Fitchburg, Mass.
Cincinnati Automatic Mach. Co., Cincinnati, O.
Cincinnati Screw Co., Twightwee, Ohio.
Dallett Co., Thos. H., Philadelphia, Penn.
Dayton Auto Products Co., Dayton, O.
Eastern Mach. Screw Corp., New Haven, Conn.
Ericsson Screw Mach. Products Co., Brooklyn.
Isles Mfg. Co., E. W., Shelton, Conn.
International Arms & Fuze Co., Bloomfield, N. J.
Link-Belt Co., Philadelphia, Chicago.
Meisel Press Co., 946 Dorchester Ave., Boston.
National Acme Co., Cleveland, Ohio.
National Mach. Tool Co., Cincinnati, Ohio.
Spafford Tool Wks., Hartford, Conn.
Standard Pressed Steel Co., Philadelphia, Penn.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Tock Screw Mach. Products Corp., L. I. City.
Toledo Screw Products Co., Toledo, Ohio.
Union Tool Co., Orange, Mass.
Worcester Mach. Screw Co., Worcester, Mass.

Screw Machy., Wood and Lag
Cook Co., Asa S., Hartford, Conn.
Townsend Mfg. Co., H. P., Hartford, Conn.

Screw Machines, Automatic
Brown & Sharpe Mfg. Co., Providence, R.I.
Cincinnati Automatic Mach. Co., Cincinnati, O.
Cleveland Automatic Mach. Co., Cleveland, Ohio.
Cone Automatic Machine Co., Windsor, Vt.
Davenport Mach. Tool Co., New Bedford, Mass.
Fitchburg Auto. Mach. Wks., Fitchburg, Mass.
National Acme Co., Cleveland, Ohio.
New Britain Mach. Co., New Britain, Conn.
Reynolds Mach. Mfg. Co., Massillon, O.
Townsend Mfg. Co., H. P., Hartford, Conn.

Screw Machines, Plain or Hand
Acme Mach. Tool Co., Cincinnati, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Dreses Mach. Tool Co., Cincinnati, O.
Foster Mach. Co., Elkhart, Ind.
Garvin Mach. Co., Spring & Varick Sts., N. Y. C.
Greenfield Tap & Die Corp., Machy. Division, Greenfield, Mass.
Jones & Lamson Mach Co., Springfield, Vt.
Oliver Machy. Co., Grand Rapids, Mich.
Pierce Wrapping Mach. Co., Chicago, Ill.
Southworth Mach. Co., Portland, Maine.
Warner & Swasey Co., Cleveland, Ohio
Wood Turret Mach. Co., Brazil, Ind.

Screw Plates
Bay State Tap & Die Co., Mansfield, Mass.
Brubaker & Bros., W. L., 50 Church St., N. Y. C.
Butterfield & Co., Derby Line, Vt.
Card Mfg. Co., S. W., Mansfield, Mass.
Gardner-Bryan Co., Cleveland, O.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.

Screws, Cap and Set
Allen Mfg. Co., 135 Sheldon St., Hartford, Conn.
Bristol Co., Waterbury, Conn.
Cincinnati Screw Co., Twightwee, Ohio.
Hammacher, Schlemmer & Co., N. Y. City.
National Acme Co., Cleveland, Ohio.
Strong, Carlisle & Hammond Co., Cleveland, O.
Worcester Mach. Screw Co., Worcester, Mass.

Screws, Machine
Allen Mfg. Co., 135 Sheldon St., Hartford, Conn.
Bristol Co., Waterbury, Conn.
Brown Bag Filling Mach. Co., Fitchburg, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Screw Co., Twightwee, Ohio.
Hammacher, Schlemmer & Co., N. Y. City.
Worcester Mach. Screw Co., Worcester, Mass.

Screws, Safety Set
Allen Mfg. Co., 135 Sheldon St., Hartford, Conn.
Bristol Co., Waterbury, Conn.
Hammacher, Schlemmer & Co., N. Y. City.
Strong, Carlisle & Hammond Co., Cleveland, O.

Second-Hand Machinery
(See Searchlight Section)
American Mchy. Exchange, N. Y. C.
Baird Machinery Co., W. J., Detroit, Mich.
Beal & Co., Jos., 453 Atlantic Ave., Boston.
Bennett Machy. Co., G. L., N. Y. City.
Brownell Machy. Co., Providence, R. I.
Carpenter & Woodward, Woolworth Bldg., N. Y. C.
Clifton-Pratt Co., Cincinnati.
Day Machy. Co., 651 Ellicott Sq., Buffalo, N. Y.
Eagle Machinery Co., N. Y. City.
Factory & Mill Supply Co., Boston, Mass.
Federal Machy. Sales Co., Chicago, Ill.
Fitzgerald & Co., W. H. J., Boston, Mass.
Flour City O. Iron Co., Minneapolis, Minn.
Foss Machy. & Supply Co., Geo. F., N. Y. City.
Garvin Machine Co., N. Y. City.
Gelb & Co., J., 201 Centre St., N. Y. City.
General Railway Signal Co., Rochester, N. Y.
Graves Machy Exchange, N. Y. City.
Harris Bros. Co., 35th and Iron Sts., Chicago.
Hill, Clarke & Co., 156 Oliver St., Boston, Mass.
Hill, Clarke & Co., of Chicago, Chicago, Ill.
Industrial Machy Corp., Jersey City, N. J.
Inter-Continental Machy. Corp., N. Y. City.
Kinsey Co., E. A., Cincinnati, Ohio.
Klein & Co., Nathan A., N. Y. City.
Lamberg & Co., A., N. Y. City.
Lynd-Farquhar Co., Boston, Mass.
McCoy-Brandt Mchy. Co., Pittsburgh.
McMullen Machy. Co., Grand Rapids, Mich.
Machineshop Equipment Corp., Boston.
Marshall & Huschart Machy. Co., Chicago.
Mechanical Engineering Co. Three Rivers, Can.
Modern Machy. Exchange, N. Y. City.
Morris Machy. Co., Newark, N. J.
National Products Co., E., Liverpool, Ohio.
New York Mchy. Ex., 50 Church St., N. Y.
Niles-Bement-Pond Co., 111 Bway., N. Y. City.
Niles, Inc., F. H., N. Y. City.
Osborne & Sexton Machy. Co., Columbus, Ohio.
Parmele, Chas. L., 50 Church St., N. Y. City.
Prentiss & Co., Henry, Singer Bldg., N. Y. City.
Riverside Machy. Depot, Detroit, Mich.
Seifreat-Woodruff Co., Cincinnati.
Simmons Mach. Co., Inc., 149 B'way, N. Y. City.
Spicer Mfg. Co., Plainfield, N. J.
Stickley Mach. Co., E. B., Detroit, Mich.
Stocker, Rumely, Wachs Co., Chicago.
Toomey, Frank, 127 N. 3rd St., Philadelphia, Pa.
Vonnegut Machy. Co., Indianapolis, Ind.
Walsh Machy. Co., M. J., Milwaukee, Wis.
Wayne Machy. Co., Ft. Wayne, Ind.
Weeks Mach. Tool Co., D., N. Y. City.
Westinghouse Elec. & Mfg. Co., Pittsburgh, Pa.
Wickes Mchy. Co., Jersey City, N. J.
Winterer, Herman L., Philadelphia, Penn.
Young, Corley & Dolan, Inc., 115 B'dway, N. Y.
Zelnicker Sup. Co., Walter A., St. Louis, Mo.

Separators, Moisture and Oil
Pangborn Corporation, Hagerstown, Md.

Separators, Oil and Waste
Oil & Waste Saving Mach. Co., Philadelphia, Pa.

Shafting
Aborn Steel Co., 22 Clarke St., N. Y. City.
Columbia Steel & Shafting Co., Pittsburgh, Penn.
Union Drawn Steel Co., Beaver Falls, Penn.

Shafts, Crank and Jack
New Process Gear Corp., Syracuse, N. Y.
Standard Gauge Steel Co., Beaver Falls, Penn.

Shapes, Cold-Drawn Special Steel
Columbia Steel & Shafting Co., Pittsburgh, Pa.
Union Drawn Steel Co., Beaver Falls, Penn.

Shaping Machines
American Tool Works Co., Cincinnati, Ohio.
Cincinnati Shaper Co., Cincinnati, Ohio.
Coats Machine Tool Co., 30 Church St., N. Y. C.
Cochrane-Bly Co., Rochester, N. Y.
Columbia Mach. Tool Co., Hamilton, Ohio.
Gould & Eberhardt, Newark, N. J.
Hendey Mach. Co., Torrington, Conn.
Jackson Shaper Co., Jackson, Mich.
Kelly Co., R. A., Box 488 Xenia, O.
Lynd-Farquhar Co., Boston, Mass.
Morton Mfg. Co., Muskegon Heights, Mich.
Newton Mach. Tool Wks., Philadelphia, Penn.
Niles-Bement-Pond Co., 111 Bway., N. Y. City.
Oakley Mach. Tool Co., Cincinnati, Ohio.
Ohio Mach. Tool Co., Kenton, Ohio.
Potter & Johnston Mach. Co., Pawtucket, R. I.
Prentiss & Co., Henry, Singer Bldg., N. Y. City.
Rhodes Mfg. Co., Hartford, Conn.
Smith & Mills Co., Cincinnati, Ohio.
Springfield Mach. Tool Co., Springfield, Ohio.
Steptoe Co., John, Northside, Cincinnati, Ohio.
Strong, Carlisle & Hammond Co., Cleveland, O.

Shears, Hand
Armstrong-Blum Mfg. Co., Chicago, Ill.
Oliver Mfg. Co., W. W., Buffalo, N. Y.
Tucker, W. A. & C. F., Hartford, Conn.

Shears, Power
Birdsboro Steel F. & M. Co., Birdsboro, Pa.
Ferracute Mach. Co., Bridgeton, N. J.
Long & Allstatter Co., Hamilton, Ohio.
Mitts & Merrill, Saginaw, Mich.
Niagara Mach. & Tool Wks., Buffalo, N. Y.
Royersford Fdry. & Mach. Co., Royersford, Pa.
Stoll Co., D. H., Buffalo, N. Y.
Toledo Mach. & Tool Co., Toledo, Ohio.

Sheet Metal Working Machinery
Ferracute Mach. Co., Bridgeton, N. J.
Niagara Mach. & Tool Works, Buffalo, N. Y.
Savage Co., W. J., Knoxville, Tenn.
Stoll Co., D. H., Buffalo, N. Y.
Toledo Mach. & Tool Co., Toledo, Mich.

Shell Machinery, Special
Gisholt Mach. Co., Madison, Wis.

Shelving, Steel (See Furniture, Machine Shop)

Shims
Laminated Shim Co., 533 Canal St., N. Y. City.

Slotting Machines
Betts Machine Co., Rochester, N. Y.
Garvin Mach. Co., N. Y. City.
Newton Machine Tool Wks., Philadelphia, Penn.
Sellers & Co., Wm., Philadelphia, Penn.

Sockets and Sleeves
Clark Equipment Co., Buchanan, Mich.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland, Ohio.

Special Machinery and Tools
Advance Mach. Co., The, Cambridgefi Mass.
American Mach. & Fdry. Co., Brooklyn, N. Y.
Beaver Mach. & Tool Co., Newark, N. J.
Becker Milling Mach. Co., Hyde Park, Mass.
Betts Machine Co., Rochester, N. Y.
Bicknell-Thomas Co., Greenfield, Mass.
Bilgram Mach. Wks., Philadelphia, Penn.
Blake & Johnson Co., Waterbury, Conn.
Boston Scale & Mach. Co., Boston, Mass.
Coats Mach. Tool Co., 30 Church St., N. Y. City.
Columbus Die Tool & Mach. Co., Columbus, O.
Cowdrey Mach. Wks., C. H., Fitchburg, Mass.
Davis-Bournonville Co., Jersey City, N. J.
Dexter I. H. Co., 27 Walker St., N. Y. C.
Douglas, W. & B., Middletown, Conn.
Earle Gear & Mach. Co., Philadelphia, Pa.
Feeney Tool Co., Bridgeport, Conn.
Fischer Machine Co., Philadelphia, Pa.
Franklin Machine Co., Providence, R. I.
G. K. Mach. & Tool Co., N. Y. City.
Garvin Machine Co., N. Y. City.
General Machine Works, York, Pa.
Gisholt Mach. Co., Madison, Wis.
Greenfield Tap & Die Corp., Greenfield, Mass.
Grover File Co., Nashua, N. H.
Hartford Special Mchy. Co., Hartford, Conn.
Harris Eng'g. Co., H. E., Bridgeport, Conn.
Hoefer Mfg. Co., Freeport, Ill.
International Oxygen Co., N. Y. C.
Krasberg Eng. & Mfg. Co., Chicago, Ill.
Lambert & Todd Mach. Co., Camden, N. J.
Lincoln Machine Co., Pawtucket, R. I.
Lindstrom Die Tool & Gauge Wks., Bridgeport, Ct.
McCulloch A. P., Mach. Co., Boston, Mass.
Marvin & Casler Co., Canastota, N. Y.
Mehl Machine Tool & Die Co., Roselle, N. J.
Meisel Press Mfg. Co., Boston, Mass.
Myer-Moran Co., Baltimore, Md.
Nazel Engineering & Machine Wks., Philadelphia.
Newman Mfg. Co., 717 Sycamore St., Cincinnati.
Newton Machine Tool Works, Philadelphia, Penn
Oswego Machine Works, Oswego, N. Y.
Oxweld Acetylene Co., Chicago, Ill.
Pearce & Co., Frederick, 18 Roe St., N. Y. City.
Peerless Machine Co., Racine, Wis.
Perfection Machine Wks., Inc., Buffalo, N. Y.
Perry Machine Co., F. W., Youngstown, Ohio.
Reynolds Mach. Mfg. Co., Massillon, O.
Robbins, Gamwell & Co., Pittsfield, Mass.
Rowbottom Machine Co., Waterbury, Conn.
Schonert & Sons, Carl, Newark, N. J.
Sheffield Machine & Tool Co., Dayton, Ohio.
Sloan & Chace Mfg. Co., Newark, N. J.
Southworth Machine Co., Portland, Maine.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Underwood & Co., H. B., Philadelphia, Pa.
United Mach. Wks., 55 W. 3d St., New York.
Waltham Mach. Wks., High St., Waltham, Mass.
Webster & Perks Tool Co., Springfield, Ohio.
Wilcox Motor & Mfg. Co., Saginaw, Mich.
Worcester Mach. Works, Worcester, Mass.

Springs
Barnes Co., Wallace, 38 Wallace St., Bristol, Ct.
Cook, Chas. A., & Co., Inc., Brooklyn, N. Y.
Hubbard Spring Co., M. G. Pontiac, Mich.

Sprockets and Chains
Baldwin Chain & Mfg. Co., Worcester, Mass.
Bilgram Mach. Works, Philadelphia, Pa.
Boston Gear Wks., Norfolk Downs, Quincy, Mass.
Caldwell & Son Co., H. W., Chicago, Ill.
Grant Gear Works, 151 Pearl St., Boston, Mass.
Link-Belt Co., Chicago, Philadelphia.
Meisel Press Co., 946 Dorchester Ave., Boston.
Morse Chain Co., Ithaca, N. Y.
Philadelphia Gear Works, Philadelphia, Pa.
Whitney Mfg. Co., Hartford, Conn.

Squares
Starrett Co., L. S., Athol, Mass.

Stampings, Metal
American Pulley Co., Philadelphia, Pa.
Blum & Co., Julius, 510-512 W. 24th St., N. Y. C.
Cook, Chas. A., & Co., Inc., Brooklyn, N. Y.
Detroit Stamping Co., 951 W. Fort St., Detroit.
Gem Mfg. Co., Pittsburgh, Pa.
Geuder Paeschke & Frey Co., Miukaukee, Wis.
Globe Machine & Stamping Co., Cleveland, Ohio.
Kales Stamping Co., Detroit, Mich.
Krasberg Eng. & Mfg. Co., Chicago, Ill.
Lansing Stamp & Tool Co., Lansing, Mich.
Lindstrom Die Tool & Gauge Wks., Bridgeport, Ct.
New Britain Mach. Co., New Britain, Conn.
Root Co., C. J., Bristol, Conn.

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Pannier Bros. Stamp Co., Pittsburgh, Pa.

Stands, Portable (See Furniture, Machine Shop)

Steam Specialties
Dart Mfg. Co., E. M., Providence, R. I.

Steel, Cold Rolled Strip
Blum & Co., Julius, 510-512 W. 24th St., N. Y. C.
Cyclops Steel Co., 120 Broadway, N. Y. City.
Hawkridge Bros. Co., 303 Congress St., Boston.

Steel Hardness Measuring Instruments
Short Instrument & Mfg. Co., N. Y. C.

Steel, Scrap Reclamation
Onondaga Steel Co., Inc., Syracuse, N. Y.

Steel, Shafting and Free Cutting Screw
Abora Steel Co., 22 Clark St., New York City.
Blum & Co., Julius, 510-512 W. 24th St., N. Y. C.
Columbia Steel & Shafting Co., Pittsburgh, Pa
Cyclops Steel Co., 120 Broadway, New York City.
Hawkridge Bros. Co., 303 Congress St., Boston.
New England Drawn Steel Co., Mansfield, Mass
Union Drawn Steel Co., Beaver Falls, Pa.

Steel, Sheet
Abora Steel Co., 22 Clarke St., New York City.
Boker & Co., H., 101 Duane St., N. Y. City.
Colonial Steel Co., Pittsburgh, Pa.
Hawkridge Bros. Co., 303 Congress St., Boston.
Hobson, Houghton & Co., Ltd., N. Y. City.
Jessop & Sons, Wm., 91 John St., New York City.
Latshaw Steel & Metal Products Corp., N. Y. C.
Ward's Sons, Edgar T., Boston, Mass.

Steels, Alloy
Abora Steel Co., 22 Clarke St., New York City
Boker & Co., H., 101 Duane St., New York City.
Carnegie Steel Co., Pittsburgh, Pa.
Cyclops Steel Co., 120 Broadway, New York City.
Firth-Sterling Steel Co., McKeesport, Pa
Halcomb Steel Co., Syracuse, N. Y.
Hawkridge Bros. Co., 303 Congress St., Boston.
Jessop & Sons, Wm., 91 John St., N. Y. City.
Ludlum Steel Co., Watervliet, N. Y.
Vanadium Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.
Williams & Co., J. H., Brooklyn, N. Y.

Steels, Carbon
Abora Steel Co., 22 Clarke St., New York City.
Boker & Co., H., 101 Duane St., New York City.
Carnegie Steel Co., Pittsburgh, Pa.
Cyclops Steel Co., 120 Broadway, N. Y. City.
Federal Tool & Alloy Steel Corp., 12 Platt St., N.Y.
Firth-Sterling Steel Co., McKeesport, Pa.
Halcomb Steel Co., Syracuse, N. Y.
Hawkridge Bros. Co., 303 Congress St., Boston.
Hobson, Houghton & Co., Ltd., N. Y. City.
Jessop & Sons, Wm., 91 John St., New York City.
Latrobe Elec. Steel Co., Latrobe, Pa.
Ludlum Steel Co., Watervliet, N. Y.
Onondaga Steel Co., Inc., Syracuse, N. Y.
Vanadium Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.
Ward's Sons, Edgar T., Boston, Mass.
Western Tool & Mfg. Co., Springfield, Ohio.

Steels, High-Speed
Abora Steel Co., 22 Clarke St., New York City
Armstrong Bros. Tool Co., Chicago, Ill.
Atlas Crucible Steel Co., Dunkirk, N. Y.
Boker & Co., H., 101 Duane St., New York City.
Colonial Steel Co., Pittsburgh, Pa.
Cyclops Steel Co., 120 Broadway, New York City.
Davidson Tool Mfg. Corp., N. Y. C.
Firth-Sterling Steel Co., McKeesport, Pa.
Halcomb Steel Co., Syracuse, N. Y.
Hawkridge Bros. Co., 303 Congress St., Boston.
Hobson, Houghton & Co., N. Y. City.
Latrobe Elec. Steel Co., Latrobe, Pa.
Ludlum Steel Co., Watervliet, N. Y.
Onondaga Steel Co., Inc., Syracuse, N. Y.
Vanadium Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.
Ward's Sons, Edgar T., Boston, Mass.
Williams & Co., J. H., Brooklyn, N. Y.

Stools, Shop
Manufacturing Equipment & Engineering Co., Framingham, Mass.
New Britain Mach. Co., New Britain, Conn.

Straightening Machinery
Shuster Co., F. B., New Haven, Conn.
Springfield Mach. Tool Co., Springfield, Ohio.
Towsley Mfg. Co., John T., Cincinnati, Ohio.

Stud Setters, Opening
Errington, F. A., 41 Cortlandt St., N. Y. City.

Subpresses and Dies
Waltham Mach. Wks., High St., Waltham, Mass.

Supplies, Factory and Mill
Hammacher, Schlemmer & Co., New York City.

Swaging Machines
Etna Machine Co., Toledo, Ohio.
Torrington Co., Excelsior Plant, Torrington, Ct.

Switches and Switchboards
General Electric Co., Schenectady, N. Y.
Sprague Elec. Works, 527 W. 34th St., N. Y. C.
Westinghouse Elec. & Mfg. Co., E., Pittsburgh, Pa.

Tachometers
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Philadelphia, Pa.

Tanks and Pumps, Oil
Gilbert & Barker Mfg. Co., Springfield, Mass.

Tap Extensions
Allen Mfg. Co., 135 Sheldon St., Hartford, Conn.

Tap Holder
Bay State Tap & Die Co., Mansfield, Mass.
Errington, F. A., 41 Cortlandt St., N. Y. City.
Gisholt Mach. Co., Madison, Wis.
Greenfield Tap & Die Corp., Greenfield, Mass.

Taper Pins
Brown & Sharpe Mfg. Co., Providence, R. I.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland, Ohio.

Tapes, Measuring
Starrett Co., L. S., Athol, Mass.

Tapping Machines and Attachments
Acme Machinery Co., Cleveland, Ohio.
American Tool Works Co., Cincinnati, Ohio.
Baker Bros., Toledo, Ohio.
Beaman & Smith Co., Providence, R. I.
Bicknell-Thomas Co., Greenfield, Mass.
Carlton Mach. Tool Co., Cincinnati, Ohio.
Cincinnati Bickford Tool Co., Cincinnati, Ohio.
Dorman & Sons, John H., 1 Bethune St., N. Y.
Errington, F. A., 41 Cortlandt St., N. Y. City.
Evans Stamping & Plating Co., Taunton, Mass.
Garvin Mach. Co., Spring and Varick St., N. Y. C.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Greenfield, Mass.
Harrington, Son & Co., Edwin, Philadelphia, Pa.
Hoefer Mfg. Co., Freeport, Ill.
Modern Tool Co., Erie, Pa.
Moline Tool Co., Moline, Ill.
National Machy. Co., Tiffin, Ohio.
Sloan & Chace Mfg. Co., Newark, N. J.
Turner Machine Co., Danbury, Conn.
Webster & Perks Tool Co., Springfield, Ohio.

Taps and Dies
Advance Tool Co., Cincinnati, Ohio.
Bay State Tap & Die Co., Mansfield, Mass.
Beacon Tool & Supply Co., N. Y. City.
Bignall & Keeler Mach. Works, Edwardsville, Ill.
Brubaker & Bros., W. L., 50 Church St., N. Y. C.
Butterfield & Co., Derby Line, Vt.
Card Mfg. Co., S. W., Mansfield, Mass.
Gardner-Bryan Co., Cleveland, O.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hammacher, Schlemmer & Co., New York City.
Harris Engineering Co., H. E., Bridgeport, Conn.
Landis Mach. Co., Waynesboro, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Murchey Mach. & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
National Tool Co., Cleveland, Ohio.
Pratt & Whitney, Hartford, Conn.
Reed Mfg. Co., Erie, Pa.
Saunders Sons, D., Yonkers, N. Y.
Standard Tool Co., Cleveland, Ohio.

Taps, Collapsing
Errington, F. A., 41 Cortlandt St., N. Y.
Geometric Tool Co., New Haven, Conn.
Manufacturing Equipment Co., Chicago, Ill.
Murchey Mach. & Tool Co., Detroit, Mich.
Victor Tool Co., Waynesboro, Pa.

Testing Metals and Materials
Souther Eng'r. Corp., N. Y., Hartford, Conn.

Thermometers
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Philadelphia, Pa.
Englehard, Charles, 30 Church St., N. Y. City.
Thwing Instrument Co., Philadelphia, Pa.

Thread-Cutting Tools
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Greenfield, Mass.
Harris Engineering Co., H. E., Bridgeport, Conn.
Jones & Lamson Mach. Co., Springfield, Vt.
Krasberg Eng. & Mfg. Co., Chicago, Ill.
Landis Mach. Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Mach. & Tool Co., Detroit, Mich.
Pratt & Whitney Co., Hartford, Conn.
Rivett Lathe & Grinder Co., Brighton, Boston.
Union Tool Co., Orange, Mass.
Western Tool & Mfg. Co., Springfield, Ohio.
Williams & Co., J. H., Brooklyn, N. Y.

Threading Machines
Automatic Mach. Co., Bridgeport, Conn.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Greenfield, Mass.
Landis Mach. Co., Waynesboro, Pa.
National Acme Co., Cleveland, Ohio.
National Machy. Co., Tiffin, Ohio.
Webster & Perks Tool Co., Springfield, Ohio.

Thread Rolling Machines
National Machy. Co., Tiffin, Ohio.

Tongs
Moore Drop Forging Co., Springfield, Mass.

Tool Cases
Gerstner & Sons, H., 22 Columbia St., Dayton, O.
Waterston, J. M., 77 Woodward Ave., Detroit.

Tool Holders
Armstrong Bros. Tool Co., Chicago, Ill.
Bay State Tap & Die Co., Mansfield, Mass.
Clark Equipment Co., Buchanan, Mich.
Gisholt Mach. Co., Madison, Wis.
Green Bay Drive Calk Co., Green Bay, Wis.
Lovejoy Tool Co., Springfield, Vt.
Pratt & Whitney Co., Hartford, Conn.
Union Tool Co., Orange, Mass.
Western Tool & Mfg. Co., Springfield, Ohio.
Williams & Co., J. H., Brooklyn, N. Y.

Tool Marking, Electric
Brewster Co., Wm., 30 Church St., N. Y. City.

Tool Posts, Lathe
Armstrong Bros. Tool Co., Chicago, Ill.

Tool Work
Advance Mach. Co., The, Cambridge, Mass.
Advance Tool Co., Cincinnati, Ohio.
American Mach. & Fdry. Co., Brooklyn, N. Y.
Ames Co., B. C., Waltham, Mass.
Beaver Mach. & Tool Co., Newark, N. J.
Becker Milling Mach. Co., Hyde Park, Mass.
Bicknell-Thomas Co., Greenfield, Mass.
Bowen Mach. Co., Geo. F., Newark, N. J.
Brown & Sharpe Mfg. Co., Providence, R. I.
Browning & Co., Victor R., College Point, N. Y.
Budd & Ranney Engr. Co., Cleveland, Ohio.
Capital Die Tool & Mach. Co., Columbus, Ohio.
Columbus Die Tool & Mach. Co., Columbus, O
Cowdrey Mach. Works, C. H., Fitchburg, Mass
Detroit Stamping Co., 951 W. Fort St., Detroit
Dodge Tool Co., Grinnell, Iowa.
Feeney Tool Co., Bridgeport, Conn.
Ferracute Mach. Co., Bridgeton, N. J.
Franklin Die & Tool Co., Columbus, Ohio.
G. K. Mach. & Tool Co., N. Y. City.
Gale-Sawyer Co., 33 Wormwood St., Boston.
Gisholt Mach. Co., Madison, Wis.
Grant Mfg. & Mach. Co., Bridgeport, Conn.
Gray Mach. Co., Buffalo, N. Y.
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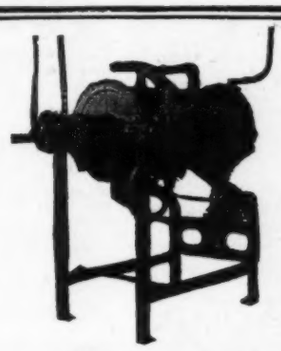

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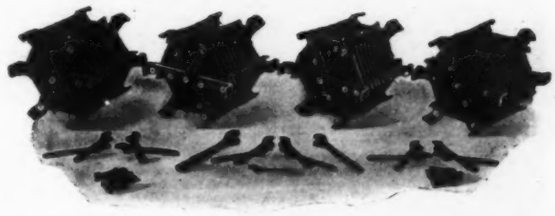

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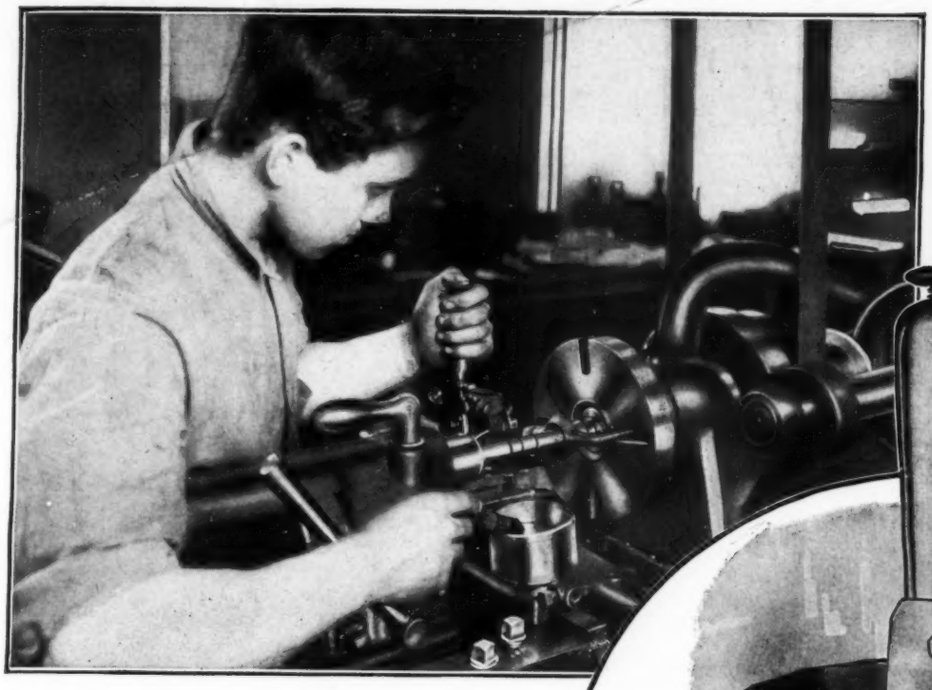

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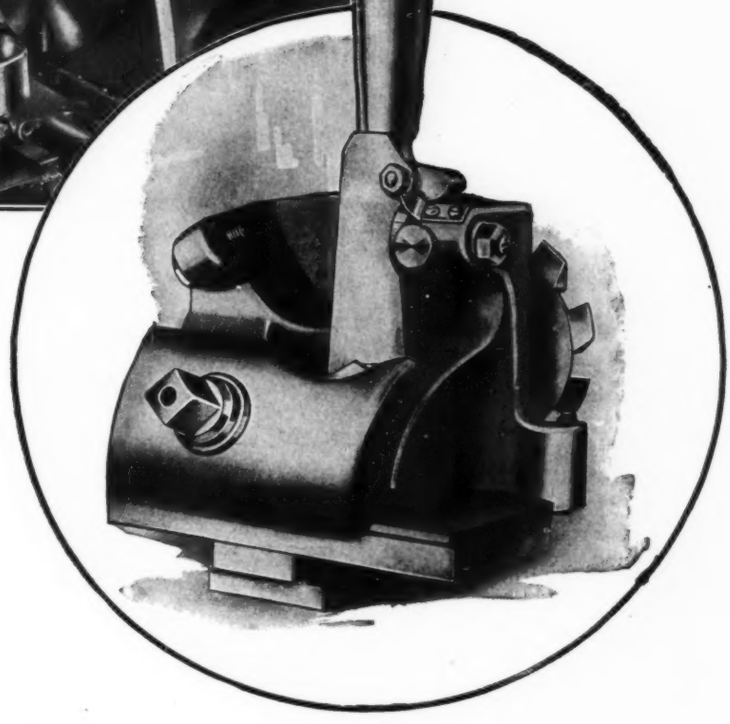

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